A Study of the Effects of Computer Use on the Social Interaction Behaviour of Malaysian Children in the Pre-School Classroom

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Declaration of Author's Copyright

I declare, except where acknowledge, all the work has been undertaken by myself.

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ABSTRACT

The purpose of this research was threefold fold: 1) to study peer interactions at the computer, 2) to study the interactions of the teachers with the children and analyse the impact of those interactions on the children's social behaviour 3) to explore teacher's beliefs, views and knowledge about computers use in four Malaysian pre-schools. Qualitative research was employed using a multiple case study approach based on constructivism. Data were obtained primarily through non-participant observations, interviews with principals, teachers and children and documentations. The results indicated that children exhibited a considerable amount of positive social interaction behaviour while playing with the computer. A variety of patterns can be seen within the peer interactions indicating that children exhibit a vast range of social interactions at the computer and they varied each day. But for the purpose of the study the researcher only concentrated on specific set of behaviour using the Children Social Interactions Behaviour checklist

The findings of this study guide us to certain conclusions, which have implications in understanding the phenomena of how computers were used and how its relationship to the children's social interactions emerge in the four Malaysian preschools.

This study provides evidence that the children's social interactions with peers and adults was mediated by the engagement of the children in the computer environments. Consistent with previous research, the children in my study mostly enjoyed using the computer. Children exhibited various contrasting behavioural approaches towards computers. In classroom B, with one exception children were uninterested in playing with computers. They acted as spectators who rarely spent time in the computer centre. In Classroom A, C and D, all the focused children acted as active and vicarious navigators who were proficient and excited about playing or watching computer activities. The computer centre can effectively encourage supportive scaffolding interactions among children as they work side-by-side to achieve the goals created by developmentally appropriate software. Studies suggest that computer use can provide a context for collaboration, co-operation, and positive learning experiences between children, or between children and adults.

This study indicates that computer activities with teacher facilitation helped promote social interactions between children. Teachers who observe carefully are likely to see that children who may seem to be minimumly and only superficially involved with their peers at the computer are actually learning by carefully observing their peers' success navigating developmentally appropriate software. Computer experts are valuable assets to the classroom. Computer centres that encourage collaboration and cooperation make important contributions to the development of a community of learners and children's growing cognitive, fine motor, and social competencies. However, this will not necessarily happen just because the computer is present in the early childhood education setting. Teachers must be conscious of the kinds of learning interactions they would like to occur in the context of computer use (including between adults and children, or between children), and adopt pedagogical strategies to support these situations.

From the case studies, it is also clear that the role of adults is vital in the computer centre and two types of teacher behaviour occurred. One was a passive role in which the teacher was only involved in computer use when she was asked by the children. This involvement was only as a technical help such as turning computer on or off. The other type of teacher behaviour was in an active role that included being a technical helper, a conflict mediator and a tutor. Teachers who exhibited an active role engaged in frequent scaffolding at the computer area by actually being involved in children's computer play. Teachers had limited information and understanding about the potential contribution of computers in early childhood education. The common belief of teachers was that computers could benefit children in self-confidence, academic areas and provide enjoyment for them. All teachers revealed that computers were not integrated into the curriculum.

Inadequate resources were enormous challenge for the two classrooms. All the classroom owned second hand computers that had limited memory capacity. The software collection of the classrooms mostly included drill and practice, game programs and few educational software both in English and Malay language. The curriculum philosophy of the classrooms determined how computers were used. In general, computers were used as a part of free play time activities. Children were encouraged to play with them independently. Children played with the computers with peers and adults except in Classroom B (case study 2). None of the classrooms used the computers in other activities. This case studies also revealed that the curriculum was an important factor that determined how computers were used in early childhood classrooms.

This study also carries several serious implications for teachers and parents. First and most important, it highlights the rich social environment offered by computer usage. Teachers should take advantage of this opportunity for fostering such cooperative learning behaviours as sharing ideas and group problem solving. Second, gender variation was seen in the frequency of computer use, with the boys using the computer more than the girls. This pattern has been observed in other studies (e.g., Haugland & Wright, 1997). Teachers need to monitor computer usage in order to ensure that girls have equal opportunities to use them. Teachers need to assess the levels of cooperation exhibited by different pairs of children and then decide on the optimum pairings. However, mixed-gender partnerships led to greater interactions. It is interesting to note that almost all of the conflicts involved pairs of mixed-gender and also they produced the largest number of interactions. Therefore, it might be worthwhile to continue mixed-gender groupings, if only to utilise this volatile and fertile opportunity for teaching conflict resolution, cooperative problem-solving, and group decision-making. Third, given the right directions, children are capable of resolving their own conflicts. Teachers, therefore, need to be careful about when they intervene and how much help they offer. Teachers and parents can better empower children by teaching them appropriate conflict resolution strategies.

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Dedication

To my wonderful parents, "Mak" and "Ayah" who have raised me to be the person I am today.

To my beloved husband, Mohd Zuki for constant encouragement, and enduring love.

To my lovely children, Athirah and Luqman, whose love, patience, and sacrifice will always be an inspiration for me.

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LIST OF ABBREVIATIONS

ECE	Early Childhood Education
MOE	Ministry of Education
ICT	Information and Communication Technology
NPE	National Philosophy of Education
CSBC	Children Social Behaviour Checklist
CDC	Curriculum Development Centre
NAEYC	National Association for the Education of Young Children
DAP	Developmentally Appropriate Practice
CD-ROM	Compact Disc Read-Only Memory
ERPD	Malaysian Educational Statistic, Educational Planning and Research
RM	Ringgit Malaysian.
MSC	Multimedia Super Corridor
NGO	Non Governmental Organizations
CIE	Computer-in-Education (CIE)
CAD/CAM	Computer-aided Design/Computer-aided Manufacturing
PTA	Parent-Teacher Association
PMR	Penilaian Menengah Rendah
SPM	Sijil Pelajaran Malaysia
STPM	Sijil Tinggi Persekolahan Malaysia
UPSR	Ujian Penilaian Sekolah Rendah

Chapter 1: Introduction

1.1 Introduction

This thesis will investigate the social interaction behaviour between children during computer use in four pre-schools in Malaysia. This chapter provides an introduction to the research, beginning with the general background to the study area, followed by an explanation of the research objectives and research questions. The significance of the research and the framework that guided the research are highlighted briefly in the subsequent section. Finally, the structure of the thesis is outlined at the end of the chapter.

1.2 Background of the study

In recent years, ICT has rapidly acquired a place in society. Without doubt, this is also true of education. After the initial emphasis on learning *about* ICT, it is now increasingly used as a *learning tool* in all forms and all levels of education from pre-school to higher education. Today's technologies have come to offer children important ways to socialise that were not previously possible. Through email, the World Wide Web, playing computer games, and more, children are enjoying the company of other children who live in far away places or the other end of town. Through the Internet, children can be connected to others, to think, share, express, laugh and experience new ideas. What technology can offer children is access to new people and cultures.

When we think about technology for children, an important aspect is the ability for computers to enhance their social experience. For example if we offer five children five computers, within 10 minutes, two to three of those children will be huddled around one computer screen. Young children prefer to interact and socialise with each other at the computer (Clement et al., 1993) and young children prefer to play computer games with their friends rather on their own (Linderoth et al., 2002). Children can find it fun to play with others and often more engaging when they get to share their experience with friends. As technology also can be viewed as a "social facilitator" rather than merely a workplace tool, computers have the potential to enhance social experience by supporting users' interactions with each other as well as with digital artefacts.

Learning with technology can provide added value in extending learning opportunities for children, often in ways that only the technology resource can offer. Such encounters can take place in all areas of the curriculum. Patterson (2004, p. 25) describes this as using ICT to "enrich the learning environment". In addition, Van Scoter and Boss (2002) point out that computers and other technologies add to, rather than replace, teachers' complement of tools and activities:

> New technologies offer teachers additional resources to use as they plan to meet a range of levels, learning styles, and the individual needs of students (Van Scoter & Boss, 2002, p.10).

Furthermore, technology used with young children will be most effective if the distinctive nature of development in the early years is taken into account. The importance of play, the quality of relationships with other children and adults, and meaningful learning contexts are all-central to the high-quality learning experiences. In selecting ICT resources for young children, factors such as robustness and mobility of equipment, choice of input devices, quality of feedback and other design features should be taken into account (Plowman and Stephen , 2003).

The ICT-driven revolution that is commonplace both in Malaysia and overseas has placed increasing emphasis on the need for governments to produce more highly educated and hence, more flexible workforces that can capitalise on new opportunities as they arise. In Malaysia, national policies promoting a 'knowledge society' encourage the use of technology to support learning and teaching. The Ministry of Education (MoE) have established strategic plans for integrating and updating technology in schools and classrooms. The Departments have also provided the infrastructure to support resources, with access to and delivery of ICT in all schools being coordinated through a range of state agencies. Further, each state in Malaysia has provided a commitment to increasing access to computers, a reduction in student-computer ratios, Internet access for schools, increased networking opportunities to link schools and classrooms to educational and community interest sites, and professional development programmes for teachers (Bank, Cresswell, & Ainley, 2003). The dramatic changes over the past decade have prompted the Malaysian Prime Minister to state that it is incumbent upon the public school system to prepare all students to use technology in ways that will allow them to compete in the increasingly complex technological workplace.

In addition, education is always an important catalyst for developing talented, relevant, skilful and sufficient manpower for a nation. The future of a nation does depend greatly on the education system of the country. It should begin with a strong foundation at the pre-school and primary education stage, followed by a systematic secondary education and ending up with a competitive but flexible tertiary system. Education brings changes to the civilization of a nation, and thus it should be viewed with a more complete and holistic approach. Therefore, the curriculum design should have the intention of creating a rich variety of lesson plans based on constructivist approaches to learning such as problem based learning and cooperative learning strategies. It should also be flexible in consideration of the range of learning abilities, acknowledge the multiple intelligence approach to learning, and celebrate the cultural diversity of students. This approach to education has the goal of creating enlightened students by developing the full potential of every student. Teaching accomplishes this goal of enlightening the student when the student has grown in heart and mind from learning new knowledge. It is the contention here that this applies to all information technologies and that it is the responsibility of the educational system to incorporate all learning architectures to facilitate student development. According to Fisher (1997), technology has become more than a set of tools to be picked up and used when a student decides to use them. It has become a required medium that mediates experience in most aspects of people's lives. Consequently, technology should be viewed by educators as a major area of study since it is one of the principal factors in determining how people experience and know their world. (Fisher, p. 28).

The 21st century also brings greater challenges to the Malaysian education system. Globalisation is coming, is already here and has been for some time, as a result of mass communications networks alongside other factors and technology does actually quicken its process. Information plays a significant role in creating knowledge. The strength of a nation in the future greatly depends on the ability of its people to acquire and to apply knowledge. Students can now enjoy their education at their own pace, either in their homes or at their workplace. The technology allows universal access to learning opportunities and recognition of learning in diverse settings.

Besides that, in 1996, Malaysia launched a programme called "The Way Forward" (Wawasan 2020), which laid out a plan to build a fully developed, knowledge-rich Malaysian society by the year 2020, through the development of the ICT sector and the use of ICT to increase global competitiveness (Sharil, 2005).

Therefore, the Malaysian education system should be able to develop the ability of students to think critically, communicate effectively and enhance the skills to seek and to use information. Multidisciplinary and collaborative approaches to teaching and learning should be adopted. This capability will enable them to learn and relearn, in order to remain competitive. The use of creative knowledge in generating the wealth and power of nations is increasing. Human resources are more important than the physical resources, and highly qualified humans can be rapidly adapted through a quality education system.

1.3 Research issues

In Malaysia, information technology is becoming a regular feature of the secondary and primary school classroom generally in the form of the microcomputer. This development has been accelerated by the introduction of the Malaysia National Curriculum which has resulted in a legal requirement for schools to deliver a certain level of IT competence to their pupils aged seven years onwards. However, whilst there is no legal requirement for children under six or pre-schools to use IT, more and more nurseries in Malaysia are incorporating the microcomputer into their classroom.

The used of microtechnology into the early years environment has raised a lot of issues which have been hotly debated among the researchers and academics. For example, questions have been raised as to whether there is a stage of 'computer-readiness' and whether early use of computers will inhibit social development. Therefore the purpose of this research is to investigate the issue of whether early use of computers will inhibit children's social development.

An understanding of the nature of Technology on the part of early childhood educators and a deliberate reference to technology when appropriate would therefore prove beneficial to children within early childhood settings. There is a growing body of evidence about the nature of technological practice in young children. (Clements, Nastasi, & Swaminathan, 1993; Haugland, 1992; Klein & Nir-Gal, 1992; Nir-Gal, 1996; 1992; Yelland, 1995, Bain, 2000; Brooker, 2003; Downes et al., 2001; Kankaanranta, 2001, Brooker & Siraj-Blatchford, 2002; Downes, 2002 and Patterson, 2004). These research findings offer some clear messages about the nature of technological practice of young children aged three to seven, and also about teaching approaches, which can positively foster the development of technological literacy.

The development of social and emotional skills in young children is considered a necessary prerequisite for healthy functioning and interactions with others. Children need to be provided with many opportunities to learn about cooperation, helping and negotiating as well as learning about feelings and emotions of self and how other social relationships can also influence technological practice. In addition, one of the Malaysian pre-school educational objectives is to develop children's social skills behaviour through its programmes. The social skills component focuses on children's interaction with the environment and the people in their surroundings, development of positive self-image, discipline, social responsibilities, and positive attitudes towards learning.

Looking at young children's social interaction with peers has provided important information and has been necessary for developing a better understanding of early childhood development in general and social development in particular. Young children's failure to develop appropriate peer interactions and positive peer relationships during childhood have been a primary predictor of behaviour difficulties and social maladjusment during adolescence (Parker& Asher, 1987).

Futhermore, early childhood is also known as a critical period in social development. Evidence has been accumulating for more than twenty years that unless children achieve minimal social competence by about the age of six, plus or minus half a year, the child is at risk for the rest of his or her life (Kazt & Mcclellan, 1997, Ladd et al, 1999). In this aspect of development, the critical period of the first six years is not due to any limitations of the brain and its development, rather it is because of what is known as the "recursive cycle", namely that whatever pattern of social behaviour a child has, the chances are that others will react to the child so that the pattern will be strengthened. If a child is friendly and approachable, others will welcome his or her company, engage and interact with the child, from which the child will gain confidence as a social participant, and opportunities to polish available skills and aquire new ones will increase. In this way the child who is easy to like becomes more likeable in a positive recursive cycle. Similarly children who are aggresive typically approach others in this manner and are rejected by them. This in turn makes them more aggressive and they repeat the rejected behaviour more intensively and gradually become excluded from peer interaction and opportunities to improve their skills in a negative cycle. Research indicates that children who are rejected by their peers early and repeatedly, eventually find each other and that they get from each other a sense of belonging and intimacy based on their shared bitterness and hostility to the rest of the community (Dishion et al, 1991).

Furthermore, almost all of the research conducted, so far, into the influence of ICT in the classroom has been with secondary and older primary children. Relatively few studies have focused on the use of technology by children under eight years of age (Baker, 2000; Labbo, 2000; Luke, 1999).

Beside that, theoretical understandings about children's development continue to be redefined over time (Clements, 2002; Luke, 1999). For example, Luke argues that:

> "Children's cognitive, behavioural, and emotional development can no longer be assumed to fit unproblematically into traditional lock-step developmental stages. Today, children's early literacy and play experiences are shaped increasingly by electronic media." (Luke, 1999, p. 97).

In other words, Luke suggests that children's early experiences with ICT and other media will impact on their development, and their experiences of childhood. Therefore, a firm understanding of the nature and content of children's social development also needs to shift accordingly.

Finally, some studies have explored young children's behaviours and interactions with computers, and with other children and adults, around computers in early childhood education settings. Common areas that have been explored include: differences between boys' and girls' behaviour and attitudes around computer use (e.g. Fletcher-Flinn & Suddendorf, 1998); and the degree to which computer use can promote or inhibit collaboration between children, or comparisons of children's behaviour around, or interest in, using computers, compared with other kinds of play and activity in early childhood education settings (e.g. Graham & Banks, 2000). Graham and Banks argue that research about what actually happens when computers are available to children in early childhood education settings is needed in order for teachers to make good judgments about how, and when, to use computers with young children. In such studies, teachers generally feature in a passive supervisory role. Research of this type often leads to recommendations about the roles that adults could or should play in order to support and scaffold children's interactions. For example, guidance to help adults to create collaborative environments around the computer, to ensure that all children have adequate access to a computer and support whilst using the computer, and to ensure that children's computer interactions are meaningful and have a learning purpose.

1.4 Research Aims/Objectives and Questions

The purpose of the study is to explore how computer technology is integrated into pre-school activities and its relationship with children's social interaction behaviour in four different pre-school classrooms. The major question of interest in the present study is to investigate the social interaction behaviour of children when using computers in the Malaysian pre-school classroom.

Thus, the aims and objectives of the research are to gain a better picture and understanding of children's social interaction during computer use. The overall aims of the study are:

1) To examine the impact of computer play on the social interaction behaviour of pre-schoolers.

2) To examine and describe pre-school teachers' views and conceptions of the use of computers in the pre-school classroom.

3) To explore how computer technology is integrated into the pre-school activities of four different pre-school classrooms.

This is attempted by addressing the following research questions: Are children working with computers engaged in social interaction behaviour in the classrooms whilst using the computers?

The following questions address the conditions under which social interaction behaviour might occur:

1. What kind of social interaction is demonstrated by children when engaged in computer play activity?

2. What kind of interactions take place between teachers and the children during play with the computer?
3. How do pre-school teachers think the computers are being integrated into pre-school classroom?
4. How do teachers adapt the curriculum to incorporate the use of the computer into pre-school activities?
5. How does the physical and spatial organisation of the computers in the classroom impact on children social interaction behaviour?

All these issues will be addressed within the context of the Malaysian educational system.

In response to these questions, the researcher used a qualitative approach for collecting data. The study is set within a theoretical framework that explores the children's behaviour and the voice of both teachers and children to provide rich descriptions of computer use in the pre-school classroom. This study has also drawn on the significance of other investigations concerned with computer use in the pre-school classroom.

1.5 Significance of the Research

In the researcher's view the findings of the study could be of value to those who are either directly or indirectly concerned with the education of pre-school children, especially, in Malaysia.

The findings will:

1) Add to knowledge and understanding of the use of computers in the pre-school classroom
2) Assist teachers in the organising of classroom computer activities
3) Provide insight for policy makers on the possibility of incorporating computers into the pre-school setting.
4) Assist education officers in planning and implementing training programmes and courses for pre-school teachers.
5) Provide insight-into the formulation of curriculum guidelines for pre-school education.

Likewise, the results of the research are intended for all concerned with pre-school education to reflect and look into existing practice and see ways in which it can be improved, not for the sake of adults but for the benefit of the children. It is also intended, especially, for education officers in charge of the pre-schools to look further into the problems faced by teachers in pre-schools in carrying out 'learning through play' as envisaged in the curriculum guidelines. Finally it is intended for policy makers to provide adequate training for pre-school teachers. It is also hoped that as a result of this study, the policy makers will review the curriculum guidelines for pre-schools to incorporate explicitly how 'learning though play with a computer' can be carried out, thus assisting teachers, as it is a new phenomenon in pre-school education in Malaysia.

This study attempts to capture the experiences of teachers and children while they use computers in pre-school environments. Through reading about the challenges, successes and failures of teachers and stories and experiences of the children, early childhood teachers may draw conclusions enabling them to improve their own practice. The findings of this study may have valuable implications for early childhood teachers. Additionally, exploring teachers' experiences and practices of computer use may provide useful information for the area of early childhood teacher training.

1.6 Definition of Terms

The following definitions are provided to help clarify some of the terms used in this study.

1.6.1 Curriculum Documents

Most teachers, today, have the advantage of access to a range of ICT (e.g. computers, scanners, internet) to support work in classrooms. Computers can work to strengthen the learning process, but teachers need to work to build the curriculum, create new purposes for current software, seek out alternative software, learn the software and fit it into the curriculum (Sullivan, 1994).

The Malaysian Pre-school Curriculum (Ministry of Education, 2000) within pre-schools represents one aspect of school practice within which the use of computer technology is conceptualised. In order to meet this demand, teachers either need to design tasks that fit into the current curriculum framework, or to extend it. This study will examine teachers' work programmes through children's activities to establish how they adapt the curriculum to incorporate computer technology for teaching and learning at pre-school level.

1.6.2 Physical location and configuration of computers

Central to using technologies is careful planning which ensures that resources are placed in suitable spaces, or are portable enough to move to adequately networked spaces (Meredyth et al., 1999). For computers to be truly effective in helping students to learn, they need to be available when students are engaged in the process of learning, not simply for uses that can be predicted in advance and scheduled into a fixed time slot. An environment that encourages cooperation between students requires space for students to interact without disturbing or being disturbed by others.

Access to, the location of and configuration of computers constrain the tasks teachers set and the learning outcomes expected. This study will pay attention to the impact of the physical organisation and configuration of the computers on the teachers' and children's use of the computer and its influence on children's social interaction behaviour.

1.6.3 Children's social interaction behaviour at the computer

A key question now being asked about the integration of computers into the curriculum relates to the essential social and cooperative behaviour developed through the use of computers (Rockman, 1993). The research will use case study strategies to produce detailed descriptions of what takes place in the social interactions and to ascertain the meaning of behaviour and talk in the situation for its participants (Goodwin & Heritage, 1990). In this study children's social interaction behaviour during computer play refers to how children interact with their peers and or adults in pre-school classrooms when they are using the computer.

1.6.4 Pre-school children in Malaysia

This refers to children aged between five to six years old. This is typical of the Malaysian education system and must not be confused with the education systems in other countries.

1.6.5 Computer peripherals

A peripheral is a type of computer hardware that is added to a host computer in order to expand its capabilities. More specifically the term is used to describe those devices that are optional in nature, as opposed to hardware that is either demanded, or always required in principle such as printer, scanner, keyboard and Cd-Rom (See appendix 1)

1.7 Structure of the Thesis

Consistent with the conceptual framework, the organisation of the chapters is as follows:

Chapter 1

Presents in general the background of the research. The chapter provides the aims/objectives and research questions, the significance and conceptual framework of the research, and finally a brief outline of the thesis.

Chapter 2

The discussion commences with the fundamental theory underpinning the research study followed by other theories, which have a potential contribution to a deeper understanding of children's interaction with computers and peers in the classroom.

Chapter 3

Discusses issues relating to the education system in Malaysia particularly the pre-school system. This is followed by a discussion of the integration of ICT into the Malaysian education system and the demand for technology use in early education in Malaysia.

Chapter 4

This chapter reviews the literature relevant to the study. This chapter begins with a review of the child and play, followed a broad overview of the research that has been conducted in the following areas: computers in early childhood education, computers and play, computers and young children's social development and computers and young children's cognitive development, and the quality of software available to young children for play and learning. This is followed by a discussion of specific factors that are likely to affect computer use in pre-school classrooms such as the problems of integrating computers in the classroom. Areas of interest include the teacher's role, the teacher's attitude, views and knowledge of computers, and the role of teachers scaffolding in the computer area.

Chapter 5

Discusses the methodological choices for this research by providing a general insight of the philosophical assumptions and justification for the case study as a research strategy within

four pre-schools in Malaysia. It focuses on in-depth descriptions of the case in context and children's social interactions when using computers. It "seeks answers to questions that stress *how* social experience is created and given meaning" (Denzin & Lincoln, 2003, p.13), and establishes "in depth how things were at a particular place at a particular time" (Stake, 1995, p.38). Qualitative research techniques used by the researcher for the data collection and analyses are outlined, and the perspectives and paradigms that underpin the study are made transparent. In the second half of the chapter, the design of the study is described. In the final sections, the data collection techniques and data analysis are discussed.

Chapter 6

This chapter presents analyses of the classroom observations; interviews with the teachers, students and principals in the study; journal notes and curriculum documents for case study one. Furthermore how the physical environment, particularly the layout of the classroom, which is taken from observations and photographs, is thought to impact on the children's behaviour and learning is discussed. Children's interviews reflect how they perceive and think about the computer and how they perceive the environment when working together at the computer. Finally, the interviews with the teachers lend support to building a profile of computer integration in the school. The chapter concludes by identifying the interconnections among the major data sources.

Chapter 7

This chapter presents analyses of the classroom observations; interviews with the teachers, students and principals in the study; journal notes and curriculum documents for case study two, three and four.

Chapter 8

Commences discussion of the findings of the research, in the form of emerging themes. These emerging themes group into discussion that were organised into six major themes. The order of discussion is similar to the theme structure in the findings chapters. Finally, this chapter summarises the implications of the research findings and addresses the contributions of this research to the existing body of knowledge, its limitations and suggestions for further research.

Chapter 2: Theoretical Framework

Learning then is located in the interplay between culture and individuals and it implies the transformation of learners in terms of the nature of the tasks they master.

2.1 Introduction

The field within which the observed phenomenon is situated, educational computing, is a new field. It is one of the many emerging fields of academic study that is truly multi- disciplinary. In this study, the problem is to understand the interactions and relationships between the child and the computer in the pre-school classroom. As an interpretive work, it could benefit from a multiple perspective approach using theories that draw on the perspective of the child, the psychological; of the context, the sociological; and of the computer, the technological. While it is recognised that such blending may not be seamless, it may well be more powerful than the use of any single theory. The search for a theoretical framework that can provide a powerful explanatory and predictive basis for the phenomenon is a significant part of the study.

The study needed a theoretical framework that provided constructs and relationships with the power to describe, explain and predict the events, which occur at the meeting place of children and computers in the classroom. In the following section a number of theories are drawn together to develop the fundamental theoretical framework. The discussion commences with the fundamental theory underpinning the research study followed by other theories, which have a potential contribution to a deeper understanding of children's interaction with computers and peers in the classroom. Initially it appeared that it was a simple matter of aligning all theories within one of the three perspectives: psychological, sociological and technological.

2.2 Theories emanating from psychology perspectives

The fundamental theories that underpinned the research study were the theories emanating from psychology perspectives. There are a number of different psychological theories that have been used in the study of adults' and children's use of computers. In general these are based on a perspective of 'impact' studies where the individual is affected by the use of the computer or related technologies (Braun and

Giroux, 1989; Kubey and Larson, 1990; Rhee and Bhavnagri, 1991; Sian et al.1990; Clements, Nastasi, & Swaminathan, 1993; Haugland, 1992; Klein & Nir-Gal, 1992; Nir-Gal, 1996). The main purpose of this study was to examine the children's social interaction in the computer learning environment (pre-school classroom). Therefore, the fundamental theoretical framework for the study is derived from Social constructivist approaches of Piaget (1962), Vygotsky (1976, 1978) and Bruner (1960). This is followed by two other theories (Ecological theory and Cultural psychology) that have the potential to contribute to the current study.

2.2.1 Social constructivist approaches

Social constructivism, a variant of the theory of constructivism, offers the current study some important concepts. Its basic tenet is that the individual interacts with their environment and actively constructs knowledge by interpreting and making sense of their experiences. What the social constructivist, from a Vygotskian basis, adds to the tenet of constructivism is the contextualisation of this interaction in a socio-cultural environment where interaction with others impact both on what is learned and how it is learned. In this approach a common body of knowledge is built and shared by a social group through interactions and then it is internalised by the individual. The process of internalisation involves some personal 'adaptation' of the socially constructed meaning. This approach also highlights the importance of social interaction and the role that adults and others with expertise can play in supporting learning. The following section will discuss three constructivist approaches which make a significant contribution to the doctoral study.

a) Jean Piaget (1962)

Cognitive constructivist theorists, such as Piaget (1962), saw children's active construction of their own understanding as fundamental to their cognitive growth and regarded social development "simply as proceeding in parallel with cognitive development, and sharing the same underlying organisational principles" (Littleton & Hakkinen, 1999, p.21). For Piaget, language was the vehicle for expressing thought and communicating the results of thinking.

Piaget's greatest contribution to this world was his studies of children and their cognitive processes. His theory noted four stages of thought.

Table 2.2-1: Piaget's Stage Theory of Cognitive Development

Stages	Ages	Cognitive processes.
First Stage Sensorimotor	Birth to 18 months.	Infant interacts with the world through actions such as crying, regulated gestures, and exploring.
Second Stage Preoprational	2 yrs to 7 yrs	Pre-Schooler relates to their world through symbolic reasoning magical thought, and continue sensory activity.
Third Stage Concrete-Operational	7 yrs to Adolescence	Children begin demonstrating logical thought by using concrete examples from the world around.
Fourth Stage Formal Operational	Adolescence into Adulthood	During this time, people develop the ability to think about abstract concepts. Skills such as logical thought, deductive reasoning, and systematic planning also emerge during this stage.

Table 2.2-1 presents Piaget's four stages of cognitive development and relates them to a person's ability to understand and assimilate new information. The current study involved the children in the preoperational stage (six years old). Therefore only this stage will be discussed in detail in this section. The pre-operational stage is a time during early childhood when children start to reason, build concepts, and lay the foundation for concrete operations. "Operations are initialized sets of actions that allow the child to do mentally what was done physically before." (Santrock, 1997). Operations also involve, "the process of classification, seriation, or reversability that

generates logical thinking and understanding" (Boden, 1980). There are two substages of preoperational thought, symbolic function and intuitive thought.

The first substage, symbolic function occurs between the ages of 2 and 4. During this time the child acquires the ability to mentally represent what is not there in front of them (Santrock, 1997). Because egocentrism and animism play a role in this stage of the child's development, their mental symbols are not completely real or logical. Egocentrism, one of the characteristics of pre-operational thought is, "the child's inability to distinguish between one's own perspective and someone else's perspective" (Santrock, 1997). For instance, a child who has learned the right and left sides of their body cannot point them out on a person facing them. They also have a hard time understanding why banging on pots and pans or playing with a musical toy could increase their mother's headache when they're having so much fun.

Animism is another characteristic of pre-operational thought that adds to the magic of the young child's symbolic representation. Animism is the child's belief that things are alive or have human characteristics because they move or grow. The child believes this because he is alive and he can move and grow. The child may express this by drawing suns or flowers with faces or say that the raindrops from clouds are tears because the sky is sad. If a child were to trip over a chair, he may comment that the "chair" was mad at him and made him fall.

The second substage of Piaget's preoperational thought is the intuitive thought substage. In this stage, children 4 to 7 years of age become insightful thinkers. Children in this stage want to know the answers to all kinds of questions, for instance, "Why?", "Where?", and "How come?" for everything that happens. They tend to be so sure of their knowledge and understanding that they become unaware of how they gained their knowledge. A child at this age focuses on one characteristic of someone or something, and base their decision or judgment on that one characteristic.

In conclusion, based on Piagets's work, social interaction can assist the child in modifying his egocentric point of view. Through interactions with other children, the child finds that other people's opinion might differ from his or her own view. The child also learns that if he or she wants to convince others that he or she is right, a clear, logical argument must be developed.

In terms of play, Piaget described the levels of a child's play in accordance with his stages of cognitive development (Piaget 1962). Therefore, play contributes to the children's emerging intellect and perseveres to a degree in adult intellectual behaviour. Piaget (1962) delineated three discrete levels in play. The first, the sensorimotor stage of infancy, is supported by reflexive patterns of physical behaviours. The second level, symbolic, dramatic, or pretend play, characterises most pre-school and kindergarten children and the stage, games with rules, is the typical play of older children. As children move through early childhood to the primary grades, they engage more in games but less in dramatic play.

In Piaget's stage theory, the changes in play through each stage parallel different levels of cognitive and emotional development (as cited in Saracho & Spodek, 1998). Piaget believed that people change their ways of thinking and behaving in order to adapt to their environments and that such adaptation is important for physical survival and psychological/intellectual growth. For example, children who play over and over again with the same object, such as repeatedly pretending to drink from an empty cup, actually are practising eye-hand coordination and developing sensory-motor skills. At the same time, children practice the behaviours that are acceptable to society so that they can act appropriately in different situations. As Hughes (1999) summarises it, Piaget's theory of play focuses on play as a means of facilitating learning by exposing "a child to new experiences and new possibilities of physical and mental activities for dealing with the world" (p. 22).

Play, according to Piaget (1962) allows children to abstract aspects from the outside world and manipulate them in a way that can be adapted into their personal organizational schemes. Therefore, play contributes to the children's emerging intellect and perseveres to a degree in adult intellectual behaviour.

Much more important than the classification of play style and stages, Piaget interprets human activities, which includes play activity, from the perspective of adaptation (Bringuier, 1989,1980). Human beings must adapt to the external environment and internal cognitive structure through a variety of activities. The adaptation can be further differentiated into assimilation and accommodation. Assimilation and accommodation are always seeking a status of equilibrium. When the individual encounters conflicts between cognitive structure and perceptions, assimilation and accommodation are in a state of disequilibrium and the cognitive structure needs to reconstruct itself. From his viewpoint, playing with a concrete object is an important activity to young children. Through such activity, children can practice and re-construct their knowledge about the object. It is important to realise that knowledge must be constructed from within rather than from the external material. To young children, concrete objects are important media to trigger the disequilibrium and reconstruction process. In the constructivist classroom, a successful learning environment is enriched by two elements: (1) the teacher's constructivist philosophy and (2) appropriate play materials than can promote children's learning by means of stimulating cognitive conflict (disequilibrium). The teacher's role is always the key to a successful constructivist classroom, and the appropriate play materials are the catalyst to the enrichment of the learning environment.

Using computers in the classroom does not conflict with the constructive view point since mental activity is what determines whether a classroom is constructive. However, it does require more consideration to embed computers into a constructivist classroom. The computer world should create more degrees of freedom which enables knowledge construction (Forman & Pufall, 1988). The design of software programmes can broaden the creativity, imagination and curiosity of children as they explore the computer world. If software programmes are designed appropriately, computers can definitely trigger cognitive conflict or disequilibrium and result in a reconstruction of cognitive structures through assimilation and accommodation because appropriately designed software require children to think hard to solve a problem or programme a task. Although computer play looks abstract rather than concrete, cognitive reconstruction is still taking place in this activity.

Piaget (1962) believed that very young children have a natural curiosity, but are not capable of abstract concepts or logical thinking. In pre-schools where adults provide opportunities for combined computer and related off-computer activities, children construct literacy, cognitive, and social skills as well as basic number concepts more readily (Haugland 1992). Young children have a natural curiosity regarding technological events and they build up a storehouse of technological knowledge through numerous pre-school experiences.

In short, play materials that are effective in provoking children's thinking, creativity, and problem solving also will provide opportunities for children to learn cooperatively such as exchanging, questioning, or negotiating ideas with peers. The cooperative learning situation then can enhance children's reconstruction of knowledge. Computer software with well designed and open-ended learning environments create contexts which provide students with the opportunity to engage in authentic problem solving by generating, testing, revising, and reconstructing hypotheses; experimenting and manipulating components of the learning environment; and reflecting on what they know.

Perhaps the most influential of those attempting to apply Piaget's theories to children's computer usage was Papert (1993). Papert (1993) with more than 30 years of Logo's development, has worked with the concept of constructivism, and put his own construct on the concept that he calls constructivism in which the computers plays a vital role. In Papert's view:

> "the computer can provide the construction tools for learning. Constructionist is built on the assumption that children will do best by finding (fishing) for themselves the specific knowledge they need......The kind of knowledge children most need is the knowledge that will help them gain more knowledge. In addition to knowledge about fishing, it is as well to have good fishing lines, which is why we need computers, and to know the location of rich waters, which is why we need a large range of mathematically rich activities, or 'microworlds'" (Papert, 1993;p.139).

Papert believed that the potential of the computer in aiding development lies not in its use as a tool for teachers, but "on the contrary, its potential lies in extending children's control over their learning," (Light 1997, p. 499).

Papert claimed that Logo could benefit children's thinking and encourage exploration within an environment, so offering them a key to understanding. The turtle serves as an 'object to think with' and Logo provides an environment, which Papert called 'Mathland', where speaking the language of mathematics becomes second nature

(Papert, 1980). Papert's claims for Logo are not restricted to mathematics and he maintains that the act of programming the computer helps to develop skills, such as that of breaking down problems into manageable units, which can then be applied to other situations. Papert (1980) argues that:

> "That children can learn to use computers in a masterful way and that learning to use computers can change the way they learn everything else".

There has been much research around Papert's claims for the cognitive benefits of Logo. Whilst most evaluations of the impact of Logo has focused on individual cognitive skills, it has become apparent that working with Logo opens up possibilities for social interaction (Clements and Nastasi, 1988; Mevarech et al (1991). Nevertheless, Papert's contention was that the potential of the computer in aiding development lay not in its use as a tool for teachers, but "on the contrary, it's potential lies in extending children's control over their own learning" (Light, 1987).

b) Lev Vygotsky (1976, 1978)

Lev Vygotsky, is responsible for the social development theory of learning. He proposed that social interaction profoundly influences cognitive development. Central to Vygotsky's theory is his belief that biological and cultural development do not occur in isolation (Driscoll, 1994). The three themes that form the core of Vygotsky's theoretical framework are:

i. a developmental model of human cognitive understanding;

ii. the claim that higher mental processes in the individual have their origin in social processes; and

iii the claim that mental processes can only be understood if the tools and signs that mediate them are understood (Vygotsky, 1978).

i. Developmental nature of cognition

Vygotsky argues that the development of human mental processes can be understood only by considering how and where they occur in growth.

> "We need to concentrate not on the product of development but on the very process by which the higher forms are established....To encompass in research the process of a given thing's development in all its phases and changes—from birth to death—fundamentally means to discover its

> nature, its essence, for "it is only in movement that a body shows what it is" (Vygotsky, 1978, pp.64-65).

To produce a comprehensive account of human mental processes, several genetic domains must be examined, each with its own set of explanatory principles (Wertsch, 1985). Development can occur at three levels—at the level of the species involving evolutionary change (phylogenetic), at the level of the individual involving the span of a person's life (ontogenetic) and at the level of learning ways of thinking and doing (microgenetic). It is this third level that is of particular interest to this study.

ii. *Social nature of cognition*

Sociocultural perspectives focus on the causal relationship between social interaction and an individual's cognition (Minick, 1987; Vygotsky, 1978). Vygotsky was concerned with the social development of the mind in terms of "higher mental functions". He argued that the social context of learning is critical since higher mental functions develop through participation in social activities. At an early stage in development, a child engages in instrumental thinking when manipulating objects, and engages in speech with others including learning to use signs in talk. These two functions develop separately at first, but later merge in the use of signs, and serve to re-organise and extend the power of instrumental thinking. The use of signs is viewed as developing in a number of stages as the sign becomes an internalised tool of thought (Bredo, 1997; Moll, 1990; Wertsch, Del Rio, & Alvarez, 1995). For example, a young child attempting to tie a shoelace may fail. This beginning of the act is a gesture, but may not be recognised as such by anyone. At a later stage, the act of tying the shoelace becomes a gesture to which someone else usually responds, helping to complete the child's act. At this stage, the gesture could also function as egocentric speech in which the child tells herself/himself what to do. Finally, the whole pattern of interaction—the initial gesture and its completing response—is internalised so that the child can now tie the shoelace on her/his own. Therefore, the gesture shifts from being an external tool for completing the act by bidding another to do it, to becoming an internal tool used to engage in the activity. As Vygotsky (1978) explains: "An interpersonal process is transformed into an intrapersonal one. Every function in the child's cultural development appears twice: first, on the social level, and later, on the individual level: first, between people (interpsychological), and then inside the child (intrapsychological). This applies equally to voluntary attention, to logical memory, and to the formation of concepts. All the higher functions originate as actual relations between human individuals" (p.57).

Hence, the basic means of thought (signs) have their origin in social interaction. Vygotsky (1978) outlined his ideas about the relationship between interpsychological and intrapsychological functioning through his concept of the 'zone of proximal development' (ZPD). This concept uses the social origin of mental development to identify a child's points of developmental readiness. Vygotsky defined the zone of proximal development as the distance between a child's "actual developmental level as determined by independent problem solving" and the level of "potential development as determined through problem solving under adult guidance or in collaboration with more capable peers" (p.86). The concept of the ZPD is important because it demonstrates how learning and development are entwined. Bredo (1997) argues that if development refers to the internalisation of the whole pattern of interaction in which learning is embedded, then learning is necessary for development, since a child needs to become capable of performing part of an activity in order to enact the whole part. Development is stimulated by learning, since learning occurs through the context of the larger activity in which different parts are internalised through such meaningful participation. Thus, collaboration with another person (either an adult or a more competent peer) working within the child's ZPD, leads to development in culturally appropriate ways (Tudge, 1990). Learning, then, is not an individual process but a social process arising from various forms of collaboration.

The ZPD is an attribute of each learning event for an individual and each new learning task has its own ZPD. Key factors in determining a student's learning potential are the nature of the discourse and the quality of the teacher intervention. One way for a teacher to effectively provide the support needed for the ZPD is through 'scaffolds' (Wood, Bruner, & Ross, 1976). Scaffolds are temporary supporting and linking structures that assist students to develop new understandings and concepts. As the learner relies less on the structures, the teacher provides further support for extended or new understandings and concepts (Hammond, 2001). Speech is a primary embodiment of thought (Wood et al., 1976). Language supports children to "code information so that cognitive restructuring can occur and the learning experience (can) be made to fit into and extend an existing model of the world" (Corden, 2000, p.9).

Scaffolding devices include a restatement of prior knowledge, an explanation of a connection between new and previous information, or a clarification (DeVillar & Faltis, 1991). Maybin, Mercer and Stierer (1992, p.88) define the basic characteristics of a scaffold as follows:

> 'Scaffolding' is not just any assistance which helps a learner accomplish a task. It is help which will enable a learner to accomplish a task which they would not have been quite able to manage on their own, and it is help which is intended to bring the learner closer to a state of competence which will enable them eventually to complete such a task on their own. To know whether or not some help counts as 'scaffolding', we would need to have at the very least some evidence of a teacher wishing to enable a child to develop a specific skill, grasp a particular concept or achieve a particular level of understanding. A more stringent criterion would be to require some evidence of a learner successfully accomplishing the task with the teacher's help. An even more stringent interpretation would be to require some evidence of a learner having achieved some greater level of independent competence as a result of the scaffolding experience (that is, demonstrating their increased competence or improved level of understanding in dealing independently with some subsequent problem).

Scaffolding is thus highly interactive, with continuous interplay between teacher and student in the joint completion of a task, and dialogue is crucial as the mechanism by which support is provided and adjusted.

iii. Cultural-historical nature of cognition

The third general theme that runs through Vygotsky's formulation of a sociocultural approach is the claim that higher mental functioning or cognition is also mediated by cultural artifacts in the form of tools and signs (Vygotsky, 1978). A sociocultural view builds on the assumption that learning has to do with how people appropriate and master tools for thinking and acting that exist in a given culture (Wertsch, 1991). Learning, therefore, is located in the interplay between culture and individuals and it implies the transformation of individuals in relation to the nature of the tasks they master (Saljo, 1999).

Two different kinds of tools are identified - physical tools and psychological tools (Vygotsky, 1986). In modern society we use a number of physical tools to accomplish our goals; we use paper and pencil or a word processor to write; we use telephones, faxes and computers to communicate; we use machines to wash and dry our clothes. Resources for thinking, our psychological tools, are stored in language, thus, the most prominent medium for communicating what we hear, see and experience is ordinary talk (Mercer, 1995). It is in the context of schooling that children learn concepts about nature, history, language and social life in a range of school subjects and it is in this context that new technologies may provide experiences that are productive. The mastery of mediational means is thus an essential aspect of the process of learning. By variations in the psychological and physical tools, different features of a problem become visible for the learner. There are several potential features of technology that enable them to serve as tools for the appropriation and understanding of conceptual knowledge.

Sociocultural views of learning rest on theories that emphasise the social nature of development. Vygotsky's work has provided an important starting point for focusing on thinking and reasoning as activities which take place in particular situations. Vygotsky claimed that the intellectual skills children acquire are "directly related to *how* they interact with others" and that children "internalise and transform the help they receive from others" (Moll, 1990, p.11) to direct their subsequent problem solving behaviour. Hence, from a Vygotskian perspective, the source of individual motivation and understanding can be located in sociocultural practices. Consequently, while cognitive theorists analyse thought in terms of conceptual processes located in the individual, sociocultural theorists take the individual-in-action as their unit of analysis.

Sociocultural theorists reject the notion of knowledge as an individual construct in favour of a distributed notion of knowledge. Rogoff (1998) promotes learning as a transformation of participation in sociocultural activity which is fundamentally cultural, as a result of participation in culturally determined social activities. Ways of knowing develop historically within communities which are, in turn, transformed by the cultural artifacts that shape community practices (Lave & Wenger, 1991). For example, scientific communities represent a particular community of practice with mutual goals achieved through collective activity. This community makes use of historical cultural artifacts such as scientific theories, methodologies and technology. Through the social process, participants are transformed into becoming practitioners by developing the knowledge and skills of their community.

A key aspect of sociocutural theory is the claim that human action, including mental action (cognition), is mediated by tools that transform the individual, incorporating the individual into new functional systems of collective action. This means that tools, such as computers, fundamentally "change the nature of the task, the required processes, and the subjects who are the actors" (Renshaw, 1998, p.86). In focusing attention on the interface between speech and a child's social and cultural experiences, Vygotsky provides a model of learning that accentuates the role of talk and places social discourse at the centre of learning. For Vygotsky "speech turns inwards and becomes inner speech or internal language, both interacting with and influencing the thinking and learning process" (Corden, 2000, p.7). Influenced by Vygotsky, educationalists and psychologists have made central the role of discourse in formulating meaning (Barnes, 1992; Bruner, 1986). They argue that discourse, through the interrelationship between spoken language and learning, can enhance thinking and learning. This study takes the perspective that students construct meaning within a social context and through discourse with both teachers and peers, as a principal starting point.

Vygotsky (1977, 1978) viewed play as highly significant to development. 'Play contains in a concentrated form, as in the focus of a magnifying glass, all developmental tendencies.' (Vygotsky 1978:74). Vygotskians view play as the most significant "leading" activity of the early childhood years (Vygotsky 1977, Bodrova and Leong 1996). This means that the most significant psychological achievements of the early childhood age occur while children engage in play. Vygotsky placed play in the socio-cultural context; that is, a context in which children's play can and should be extended and nurtured by both adults and peers.

> "Play creates a zone of proximal development in the child. In play, the child always behaves beyond his average age, above his daily behaviour, in play it is as though he were a head taller than himself...play contains all developmental tendencies in a condensed form and is itself a major source of development" (Vygotsky, 1978:202)

According to Vygotsky (1978), play creates a broad zone of proximal development, both in cognitive and socio-emotional development. In make-believe play children perform above their own cognitive abilities—logical thinking, memory and attention. Their ability for deliberate behaviour and self-regulation in make-believe play is also beyond their everyday norm. Another important influence of play on development is the separation of thought from actions and objects and the development of mental representation and symbolic function. The pretend situation of play creates an imaginative dimension in which children use substitution of things and acts. Separation of the meaning from the object promotes the development of abstract ideas and abstract, verbal thinking. In actions like riding a broomstick as if it were a horse, children separate the literal meaning of the object from its imagined meaning—this, argued Vygotsky, sees the beginnings of abstract thought.

In relation to play with computers, many computer games are also role-playing games. In such games, much of the fun comes from exploring alternative identities. Stories are the vehicles for this exploration. People like stories, especially stories about themselves. Role-playing games offer players intimate roles in stories. They invite players to take ownership of new identities, to care about the well-being and success of in-game characters. Many games use a "first-person" camera, in which a player sees through the game world through the eyes of the protagonist, to foster stronger identification. Tools can increase identity fluidity, especially toys modelled on the real tools of the role. For example, a baby doll facilitates playing the role of a mother. Vygotsky saw language as a special kind of tool, and language increases a child's identity fluidity. For example, a child who mimics "how adventurers talk" can play the role more expressively and hence more intimately (e.g., Countless children grew up mimicking "Hi ho Silver! Away!"). Collaborative play, as in a multiplayer computer game, may also increase the intimacy of the new identity, since the child becomes socially identified with the role (for a limited time, at least). Vygotsky described two sisters who decided to "play sisters," and how they used play to explore and experiment with their roles and relationship. (1978, p. 95).

One of its major influences, he believed, is to set the stage for play of middle and later of childhood which is characterised by rules and which necessitates management of one's behaviour and the process of socialisation. These fulfill the vital function of enabling the development of reflective thought in children which is necessary for the acquisition of capacities that are essential not merely in education, but for life. These capacities, such as negotiation, co-operative skills and autonomy, can be developed by children through pretend play. This requires, however, the assisted discovery of adults and children's collaboration with peers. The role of the adult in nurturing this transition is illustrated in his model of scaffolding children's learning. Vygotsky's view of play as a Zone of proximal development challenged Piaget's assertion that young children discovered make-believe play independently on reaching a certain stage in their development.

Vygotsky (1978) believes that children learn by play and that symbolic play has a crucial role in the development of abstract thought because children are separating meanings from objects. The final step of constructing knowledge needs to take place within the child's mind. This concept can be used to interpret children's computer activities. Everything presented on the computer is in symbolic form such as representational symbols of tree, stones, water and cookies. On the computer, children can play with those symbols borrowed from concrete objects in the real world. At the same time, children are constructing their knowledge of abstract and representational thought. Therefore, researchers have been trying to make connections between computer activity, play and symbolic representation (Porter, 1985; Liang & Johnson, 1999).

Vygotsky (1978) suggests that social interaction scaffolds children's learning within their zone of proximal development. Guided and helped by adults or peers, children's thinking and knowledge construction can be slightly higher than their actual developmental levels. Vygotsky dwells on the role of adults and more experienced peers in transmitting information about the culture and about social skill and expectations. Vygotsky views thinking as a social process. Children are not independent problem solvers, rather, they learn from adults and peers. Vygotsky believes that social interaction makes scaffolding within the zone of proximal development possible.

Therefore, Vygotsky focused on the connections between people and the cultural context in which they act and interact in shared experiences (Crawford, 1996). According to Vygotsky, humans use tools that develop from a culture, such as speech and writing, to mediate their social environments. Initially children develop these tools to serve solely as social functions, ways to communicate needs. Vygotsky believed that the internalisation of these tools led to higher thinking skills. When

Piaget observed young children participating in egocentric speech in their preoperational stage, he believed it was a phase that disappeared once the child reached the stage of concrete operations. In contrast, Vygotsky viewed this egocentric speech as a transition from social speech to internalised thoughts (Driscoll, 1994). Thus, Vygotsky believed that thought and language could not exist without each other.

As mentioned above, Vygotsky's theory (1978) is rooted in the premise that development occurs through interactive experiences as the learner engages in activities that he/she could not do alone, but can be accomplished successfully with the support of a more skilled partner. This joint activity involves the use of mediating tools, which could be discrete symbolic systems such as language or numbers, or symbol manipulating devices, such as computers. Although Vygotsky's theory tends to focus attention on the role of the adult as a more skilled partner in the learning process, this perspective has also been applied to peer collaborative situations. The opportunities for learning through peer interaction exist because children vary in their strengths, preferred modes of expression, and levels of competence. Partners with differing skills and competencies can therefore provide each other with the skilled assistance needed to extend the others' competence. The roles of a skilled partner and learner may alternate during the collaborative activity, depending on the activity's demand for different competencies. According to this theoretical perspective, when children use computers collaboratively, development will occur when partners have different areas of competence and interact positively in dialogue which includes questioning, providing elaborated responses, and instructing. Such facilitative interactions require attentiveness, empathy, and responsiveness to one's partner. The quality of children's ongoing reciprocal exchanges is therefore a critical consideration for whether these interactions will contribute to development.

As suggested, the ideas of Vygotsky are the basic premise on which the theory of social constructivism is developed. At its simplest, social constructivism declares human learning and cognitive development to be a social and communicative process, whereby knowledge is shared and understandings are constructed in culturally formed settings. Mercer (1994) in his article entitled Neo-Vygotskian Theory and Classroom Education succinctly outlines the basic principles of constructivism and how they can be applied in the classroom. He states that Vygotsky viewed the child as a profoundly, social being who only becomes aware of itself through social interaction with others. The cognitive development of a child is not just driven by internal processes rather it is by active adaptation to its social world. Processes that occur between the child and others become the basis for processes that take place within the child. Dialogue, interaction and argument become internalised to form the basis for reflection, logical reasoning and the formation of new concepts. As a result, Vygotsky saw a central and constructive role for adults in fostering childhood development, this he felt could be best achieved through extending the child's zone of proximal development (ZPD). In other words, a student's learning or problem solving ability can be extended and enhanced by providing the appropriate kind of cognitive support and assistance. While this might seem to be a simple and basic realism, it is not always so clear-cut and sometimes teachers merely play lip service to its application and implications. Some of the misconceptions involve viewing the ZPD as an attribute of the child rather than the activity at hand. Thus the role of the teacher in developing, setting and administrating the task is of vital importance.

Similarly, the teacher is involved in more than mere facilitation. Simply developing a well-designed activity or selecting a problem solving task and then leaving the child to get on with it is not enough and actually goes against the very nature of the concept. It is the stimulus of the teacher in assisting or scaffolding the child that is of importance and any task the child can accomplish without assistance is not going to extend their ZPD. As Vygotsky stated, "Instruction is only good when it proceeds ahead of development. Then it awakens and rouses to life an entire set of functions which are in the stage of maturation, which lie in the zone of proximal development," (Mercer, 1994: 103).

In short, Vygotsky proposed that " all the higher functions originate as actual relations between human individuals" (1978,p.57), that is, children's learning and development can only be fully understood within the social context in which learning takes place. Through the speech and language exchange in social and intrapersonal context, the child's development is able to progress within the 'zone of proximal development'. Furthermore, when engaged in activities that cannot be done alone, children can accomplish and achieve their potential development level with the support of more skilled or mature partners. This joint activity could be discrete symbolic systems such as using language or numbers with symbol manipulating devices, such a computers (Lomongino, Nicholson & Sulzby, 1999). Partners with different levels of skills and competencies can provide each other with the skilled assistance needed to extend the other's competence. Therefore, when children use computers collaboratively, development will take place when partners have different levels of competence and interact positively and extensively in their dialogue.

As noted from the above discussion, the zone is not created by a "single individual", it is created by the process of social learning. Therefore, social interaction is a means of reaching children's potential development. From The Vygotskian perspective, interactions occurring during activity play a crucial role in advancing children's development. The quality of the children's learning environment, or their process of engaging in the task is another critical issue. Therefore, under which kind of learning environment should children's social interaction be promoted? Hannafin (1996) has proposed that within the open-ended learning environment, children cooperate more and learn interdependently. In the open-ended learning environment, learners are guided to invoke their own strategies and generate their own learning sequences. The open-ended approach requires the learner to utilize his/her personal knowledge and experience to experiment with, interpret, manipulate, modify, test, and revise the problem at hand. The focus is not so much on content as it is on the thought process itself. Therefore, within an open-ended learning environment, collaborative learning among children will be promoted.

An important implication from Vygotsky's argument is that within a computer learning environment, there needs to be an increase of interaction between the teacher and the learner, as well as between learners. A corollary to this proposition is that if the intended outcome of such learning experience is the improvement of problem solving skills, then the focus of such interaction should be on the skills and processes involved with problem solving. For instance, learners could be encouraged to reflect on their problem solving experience and skills, and then share the experience with each other. More capable peers could be encouraged to assist the less capable ones initially, but gradually transfer the control of tasks to the less able learners (Day, Cordon & Kerwin, 1989).

c) Jerome Bruner (1963)

Jerome Bruner was influential in defining Discovery Learning. Initially his work was influenced by Piaget but later, and to a greater extent, by Vygotsky, whose work he extensively developed. Like Vygotsky he believed the child's social environment and particularly social interaction with other people were extremely important in the process of learning. Like Piaget he believed individuals actively assimilate and accommodate in terms of an existing set of cognitive structures. Bruner uses Cognitive psychology as a base. Discovery learning is "an approach to instruction through which students interact with their environment - by exploring and manipulating objects, wrestling with questions and controversies, or performing experiments" (Ormrod, 1995, p. 442). The idea is that students are more likely to remember concepts they discover on their own.

Bruner's theory consists of three progressive stages: (1) The *enactive* stage, learning by doing - knowledge is stored primarily in the form of motor responses. And this is not just limited to children. Many adults can perform a variety of motor tasks (typing, sewing a shirt, operating a lawn mower) that they would find difficult to describe in iconic (picture) or symbolic (word) form.

(2) The *iconic* stage, learning by means of images and pictures - knowledge is stored primarily in the form of visual images. This may explain why, when we are learning a new subject, it is often helpful to have diagrams or illustrations to accompany verbal information.

(3) The *symbolic* stage, learning by means of words or numbers - knowledge is stored primarily as words, mathematical symbols, or in other symbol systems. According to Bruner's taxonomy, these differ from icons in that symbols are "arbitrary." For example, the word "beauty" is an arbitrary designation for the idea of beauty in that the word itself is no more inherently beautiful than any other word, (Bruner, 1963). At first glance these stages reflect the stages of learning from babyhood to pre-school; however, when older children, or even adults, encounter difficulties with learning at the symbolic stage, they often revert to the iconic and enactive stages in order to solve a problem. By doing this they are placing an abstract problem into an easier mode. The enactive mode of Bruner's stage theory can be associated with another important Brunerian concept: the importance of play. Children should be encouraged to play

with objects in order to build up understanding. He states constructive play should be a dominant activity of the pre-school years. However, Bruner's notion of the importance of play can also be transferred to the world of the older learner. 'Play' implies a reduction in the 'seriousness' of the consequences of errors and setbacks hence has a potentially important role in the world of the learner with low self-esteem and fear of failure.

Bruner identifies two major functions of play. First, play situations permit children to test out and modify the consequences of their actions in a context which poses no threat. This provides them with a meaningful situation in which they can learn about things without risk or fear of failure. Second, it gives children an opportunity to engage in behaviours which they would not do if under adult pressure. Just as Vygotsy believed children learn social constructs through play, Bruner argues that 'Play can serve as the vehicle for teaching the nature of a society's conventions' (Bruner, 1972:264).

The activity of playing is also characterised by a very loose link between means and ends. The absence of a fixed goal reduces the fear of failure and enhances exploration and invention. The fact that play is not excessively attached to results allows the learner to construct their own learning path, exploring what interests them, thereby reducing the risk of boredom. 'Play' also gives pleasure and even when there are obstacles, enjoyment is gained from being able to surmount these; in fact, the absence of obstacles or difficulties can create a loss of interest in the task.

Bruner's ideas give teachers insights into how important it is for them to check the kinds of material and methods they use to challenge young children. Some children may be able to handle a task at a purely symbolic level while others at the same pre-school age still need the supports of three-dimensional toys and large colourful pictures. Bruner (1983) emphasised the importance of the teacher's or the adult's "joint" attention when a very young child expresses interest in an event or object. He advised adults to "scaffold" toddlers' early communication signals. That is, the adult constantly and gradually expects the toddler to participate more and more in linguistic markers for games and activities in which they are both engaged. Thus, as a theorist, Bruner too emphasises the critical role of the adult in children's early learning transactions.

Bruner has shown that children encouraged to first play with materials are far more creative when solving problems using those materials. He suggests that play loosens the coupling between ends and means and allows for exploration of different combinations. In work, people hold the end steady and vary the means until they achieve an end. But in play, people can also do the opposite (Brunner, 1985). Children see play as an activity that they chose voluntarily, directed themselves, and conducted in an uninterrupted time span (i.e., work as required activity). Bruner's research indicates that play is richest when the material has a clear-cut variable means-end structure, has some constraints, and yields feedback that students can interpret on their own. Interestingly, these descriptions originally about puzzles and building blocks-fit certain computer environments quite well.

In conclusion, Vygotsky's (1978) concept of 'The Zone of Proximal development' and Bruner's (1966) idea of scaffolding both claim that if children are supported by more knowledgeable others as they learn, and these need only be one step ahead, they will be able to move forward more quickly than if they tried to learn alone.

Within the constructivist philosophy there are two major emphases: cognitive oriented constructivism and socially-oriented constructivism. Whereas cognitive-oriented constructivism highlights the role of an individual in the development of his or her thinking, socially oriented constructivism stresses more the collaborative efforts of groups of learners in individual thinking (Von Glassefeld, 1991). According to Wertsch and Tulviste (1998), this later emphasis is currently having most influence on teaching and learning in early childhood education.

If we view the computer as a medium, we can argue that it can enhance the very nature of how and what we communicate. It facilitates inter-subjectivity (communication between learners), and intra-subjectivity (communication between the learner and him/herself) (Vygotsky & Kozulin, 1996; Vygotsky & Vygotsky, 1980). Such communication is an essential part of learning. Teachers must communicate ideas and facts to students; students communicate with other students in social learning situations to develop answers to questions, to reflect on their understanding, and to concretise their ideas.

This approach highlights the importance of social interactions and the role that adults and others with expertise can play in supporting learning. What it does not do is provide any useful constructs which recognise the power of cultural artifacts to help shape the socio-cultural context nor does it elucidate the nature of the interactions between individuals and their technologies.

2.2.2 Ecological psychology

Bonfrenbrenner's ecological system theory (Bronfenbrenner, 1997) sees the developing child within a complex system of relationships affected by multiple levels of the surrounding environment. These levels extend the child's environment beyond the immediate to include other social settings outside of the child's experience that nonetheless affect her/him. Bronfrenbrenner stresses the importance of viewing children in all areas of their environment. He also sees a significant role for the wider social-cultural context. Bronfenbrenner describes four nested levels that influence the child's development:

- The microsystem refers to relations between the child and the immediate environment, which would include teacher interaction and joint activity, the time-space interface and type of software etc.
- The mesosystem that refers to the interactions and relationship between and among the child's home, school, neighborhood, and peer group.
- The exosystem that refers to the social settings that do not contain children but which affect the child's experiences in immediate settings such as the Malaysian Pre-School Foundation Curriculum, Malaysian National Curriculum and the commercial world of ICT.
- The macrosystem that refers to the cultural values and laws concerning early childhood, such as the Malaysian system of schooling, literacy and ICT in the Malaysian culture.

Importantly, Bronfenbrenner stresses that all relationships are bi-directional and reciprocal within these levels. For example within any microsystem component such as the classroom, "the structure and content of the setting, and the forms of developmental process that can take place within it, are to a large extent defined and delimited by the culture, subculture, or other macrosystem structure in which the microsystem is embedded" (Bronfrenberener, 1989). He sees children as both products and producers of their environments in the levels in which they participate. This theory does offer a conceptual framework for positioning the school within the wider social context and for discussing the relationship between both mesosystem and exosystem influences on children's social interactions. What it lacks is explicit recognition of the role of the cultural artifact. Cultural artifacts are objects, symbols, narratives, or images inscribed by the collective attribution of meaning. Examples of cultural artifacts include the computer in classrooms. Cultural artifacts are essential to identity work. According to Vygotsky's notion of semiotic mediation, such artifacts are central to humans' abilities to modulate their own behaviour, cognition and emotion. Conceivably, the reciprocal and bidirectional role of the cultural artifacts as well as adults and other children, at the microsystem level, would be consistent with the overall theory. For these reasons, this theoretical framework is able to make a significant contribution to the theoretical framework for this study, because it provides a way of categorising the socio-cultural context of children's computer use in the pre-school classroom

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2.2.3 Cultural psychology

Crook (1992) defines cultural psychology in the following way:

> Cultural psychology confronts the fact that human development occurs in an environment fashioned by the creative activity of very many previous generations. It invites us to pay special attention to this feature of the human conditions; to recognize that development takes place in a medium of culture. It dwells on our engagement with the various technologies and the various social rituals that have evolved to mediate our interactions with the material environment and with each other. (p.223)

The above approach differs in a number of ways from more traditional psychological approaches. It foregrounds the role of the artifact, it makes the child-in-context the unit of analysis and it makes central the issues of 'mediational means'. Crook (1992) argues that this approach is more appropriate for the study of the social development of children interacting with computers because it acknowledges that children's social experiences occur within particular settings and are organised around artifacts that shape the nature of the social interactions that unfold.

This theoretical framework recognises the importance of all three elements: the child, the artifact (computer) and the environment. However, it fails to emphasise the child as active, the child who shapes the context and the cultural artifact at the same time as being shaped by it. It also fails to provide useful constructs to understand better the 'mediational means' of the interactions between child, computer and the socio-cultural context.

2.2.4 Conclusion

While the above psychological theories mainly focus on an understanding of social and cognitive development, they provide some useful concepts for thinking about the nature of children's interactions with the computer in their classroom. All three theories stress the importance of the socio-cultural context within which the interactions take place. In this study, the school (classroom) and the human being (peer and teacher) provide that context. Importantly, social constructivist theories provide some key concepts for explaining how children construct their knowledge through the processes of developing shared understandings with those around them. Finally through Bronfenbrenner's ecological systems theory, the importance of the indirect contributions of the wider socio-cultural context (mesosystem, exosystem and macrosystem) also can be highlighted.

2.3 Theories emanating from a sociological perspective

To date sociological theories, or those derived from them, have made little contribution to the understanding of children's interactions with computers. This is not to say that sociologist have ignored this new technology, but rather, they have concentrated on theories which provide frameworks for understanding the social construction of technology in the adult world, particularly in terms of the way economic and military interests have shaped technological choices and discourses and the interaction of these with social class gender. Interest in children seems to have been lacking. It would appear as if sociologists generally regard the relationship between children and computers as a psychological phenomenon.

At a broader level, there have been continuing concerns about the many branches of sociology ignoring childhood, or treating it from the perspective of socialisation theory, which, according to James and Prout (1990), only regards childhood as a rehearsal of adult life. From this perspective, children are passive subjects of structural determinations, not unlike the role children have in behavioral theories within psychological tradition. In response to this concern, childhood studies or the sociology of childhood is emerging as a separate field of study within sociology.

2.3.1 Childhood studies

A complex range of reasons exists for the emergence of a field of childhood studies. These reasons are carefully presented and discussed by James and Prout (1990). In summary, they are:

- The increasing problematisation of childhood as images of famine, war, poverty, and the growing awareness of child abuse that challenge traditional beliefs of childhood. This builds on the work of Aries (1961) which looked at the historical changes in conceptions of childhood;

- The 'silence' of the child's voice in empirical research about and for children. Too often they are represented as immature adults or in the passive voice as recipients of adults' attention and treatment, or as mentioned above, the subjects of structural determinations;

- The dissatisfaction with developmental theory and socialisation theory as the organising basis for any theoretical frameworks in sociology and other disciplines for empirical research and policy development relating to children.

While James and Prout (1990) clearly state that this paradigm is still developing theoretical and empirical frameworks, they offer the following six features as defining the new paradigm. They describe it as an 'emergence' paradigm, because it is not yet fully developed but still in the process of formation. Prout and James identify the distinctive features of the new paradigm as follows:

1. Childhood is understood as a social construction. As such it provides an interpretative frame for contextualising the early years of human life. Childhood, as distinct from biological immaturity, is neither a natural nor a

universal feature of human groups but appears as a specific structural and cultural component of many societies.

2. Childhood is a variable of social analysis. It can never be entirely divorced from other variables such as class, gender, or ethnicity. Comparative and cross-cultural analysis reveals a variety of childhoods rather than a single and universal phenomenon.

3. Children's social relationships and cultures are worthy of study in their own right, independent of the perspective and concerns of adults.

4. Children are and must be seen as active in the construction and determination of their own social lives, the lives of those around them and of the societies in which they live. Children are not just the passive subjects of social structures and processes.

5. Ethnography is a particularly useful methodology for the study of childhood. It allows children a more direct voice and participation in the production of sociological data than is usually possible through experimental or survey styles of research.

6. Childhood is a phenomenon in relation to which the double hermeneutic of the social sciences is acutely present. That is to say, to proclaim a new paradigm of childhood sociology is also to engage in and respond to the process of reconstructing childhood in society.

(Prout and James, 1990:8-9)

The first four of these features have importance for the current study. In particular, the notion of childhood as a social construction stresses the importance of understanding childhood as it exists and is portrayed today through both the discourses that surround childhood and the 'lived' experiences of children. Children's interactions with computers can only be understood in terms of the wider conceptions of their childhood. For example, much of the rhetoric around issues of concern by politicians and parents about children's playing of violent computer games stems from conceptions of children on the one hand as innocent and in need of protection and on the other hand as vulnerable to corruption and even potentially dangerous.

Corsaro (1997) has made a substantial contribution to thinking about the relationship between *structure* and *agency* in childhood with his concept of *interpretive reproduction.* The idea behind this concept is that children work to reproduce themselves, their culture and their social relationships, but that in doing so they interpret them for themselves. As he puts it:

a) Children actively contribute to cultural production and change.

b) They are constrained by the existing social structure and by societal reproduction.

c) Within these constrains, children's participation is *creative* and *innovative.*

Carsaro (1997) used his concept of 'interpretive reproduction' in studying children's peer cultures. According to Carsoro children's early participation in peer culture is mediated by adults, for instance, it takes place in pre-school settings to which parents arrange access for their children. In these settings children first encounter ideas of sharing and collective ownership, and of friendship. The central themes in children's initial peer cultures', according to Corsaro are: attempts to *gain control* of their lives, attempts to *share* that control with each other, and the importance of size and of the idea of 'growing up'. He explores these themes though studies of play routines, of children's protection of their interactive space, and of sharing routine and rituals.

2.3.2 Cultural studies

Cultural studies as a theoretical approach also provides some useful concepts for the study. Originally blended from an encounter with literary studies and sociology, it draws on a wide range of theoretical approaches, such as post structuralism and the broader socio-cultural theories of language and cognition. Slack (1989) states that the central questions of cultural studies involve the role of ideology and power in the relationship between textuality, discourse and social practice.

Textuality or children/teacher interactions need defining for the purpose of the study. Luke (1995-1996) defines 'text' as "language in use...any instance of written and spoken language that has coherence and coded meaning...texts are those artifects of human subjects' work at the production of meaning and social relations." Texts include talk between children and children, teachers and children, artifacts such as stories, advertisements, government policies, computer software such as games or word processing software. Luke (1996) explained that texts can position and construct individuals and groups, making available various meanings, ideas and versions of the world. At the same time, they are used by individuals and groups to make sense of their world and to construct social actions and relations.

In relation to the study, this approach has in many ways the best fit in terms of the current study. It recognises the inter-connection of people, technology and classrooms. It also provides concepts such as 'text' to explain how the relationship between children, technology and social context (pre-school classrooms) are mediated. Morley and Silverstone (1990) have used this theoretical approach in their studies of domestic computing. They defined the technology as a text in the sense that there is a discourse of computers and computing that influence its meaning and relevance in everyday life.

2.3.3 Conclusion

Both childhood studies and cultural studies offer much to a developing theoretical framework for the study. In many ways, the approach they adopt is consistent with the notion of the shared construction of knowledge put forward in the theories of social constructivism.

2.4 Theories emanating from a technological perspective

A number of technological theories exist which attempt to explain the relationship between technology, society and individuals. These include general theories of the social construction of technology, theory of the computer as an evocative object and theory of affordance. However for the purpose of the study only one theory will be discussed. In the researcher's opinion, this theory also has the potential to make a significant contribution to the doctoral study.

2.4.1 The computer as an evocative object

Turkle's (1984) found that,

> "(The computer)... enters into children's process of becoming and into the development of their personalities and ways of looking at the world ... Children in a computer culture are touched by the technology in ways that set them apart from the generations that have come before" (p. 165).

Turkle's (1984) theory is that the computer is an evocative object. As well as being instrumental, she argues that it is a projective medium that stimulates children's thinking about their physical and psychological world. She postulates that there are three stages in children's relationships with the computer. They are the metaphysical, mastery and identity. In the metaphysical mode, which dominates the early childhood years, children construct theories that help them situate the computer in the world of living and non-living things. They tackle concepts such as animate and inanimate, conscious and not conscious. They are reflective about their world and the place of the computer. In the mastery mode, which is linked to the primary years, children are more concerned with 'winning', with mastering the computer and the wide variety of games available on the computer. Turkle sees this as a time of action rather than reflection. Seeking challenges is a dominant activity in this mode. In the identity mode, which is dominant in the early adolescent years, experiences are focused on questions of identity, making sense of self, particularly in relation to how others see the self. Turkle argues that sexual identity is an important issue at this stage.

These three modes of relating are not exclusive. An individual can relate in all three ways, but for many, as a function of their age, personality and social world, one of them becomes predominant. Turkle further found that these modes also related to differences in adults' relationships with computers where the computer played a large part in the adults' lives.

Turkle builds her theory on data collected in the early 1980s from children and adults, where the use of computers formed a large part of their lives. The adults were programmers, PC owners or those interested in artificial intelligence. Given the year of the study, these adults would have to be considered innovators with the technology. The children were also significant users of computers and related technologies at a time when they were still considered novel. In fact, the timing of this study places it at a period where strong social discourse about computers had yet to emerge and the individual's familiarity with computers preceded a wider social or cultural familiarity.

One of the strengths of Turkle's theory, in terms of the focus of the current study, is the balance between the perspective that the technology has a determinative impact and the opposite extreme that technologies can only be understood in terms of the meanings people give them. Another is the recognition that the computer is a particularly rich and varied technology that can serve a wide range of purpose. This fits comfortably with the notion of the multifunctionality of the computer and with the notion that different children may interact with computers in markedly different ways. Certainly all the participants in Turkle's study had gone beyond instrumental uses.

However, there are a number of limitations with Turkle' theory. Firstly, it pays too little attention to the wider social and cultural context. There is no conceptual framework for linking the actions and interactions between the individual and the computers in the broader social and cultural situation, nor with the specific situation in which these individuals encountered the computers and related technologies.

Secondly, there is a sense of exaggeration of the power of the computer to evoke. Tukle's fails to contextualise the cognitive or intellectual development of the children she is working with. Research about children's emerging theory of mind would suggest that many objects, experiences and events in the daily lives of younger children evoke thinking about concepts such as 'real' and' unreal', 'live' and 'not live' (Dockett, 1994; Flavell, Flavell and Green, 1987). In this context the computer would be yet one more stimulant for this type of metaphysical thinking, albeit one whose opaque processes and properties might be a particularly sharp stimulus. Similarly, older children in their non-computing life are involved with a wide variety of play situations where mastery of games with rules is a natural part of their lives and many early adolescents are immersed in their search of identity through peer relations and the images they are presented with in the media as well as their close personal relationships. What Turkle's theory fails to answer is whether the computer can evoke new or novel insights in the minds of the children using it or whether it behaves in the same ways as many other cultural artifacts.

2.4.2 Conclusion

She sees computers as aiding in the erosion of boundaries between the real and the virtual, the animate and the inanimate, the unitary and the multiple. As Turkle says, "Today, the debate about computers in education centres around the place of educational software and simulations in the curriculum." (Turkle, 1997, p80) Simulations borrow from Dewey's concept of "learning by doing" as illustrated in this example:

> Tim's approach to SimLife is highly functional. He says he learned his style of play from video games: "Even though SimLife's not a video game, you can play it like one." By this he means that in SimLife, like video games, one learns from the process of play. You do not first read a rule book or get your terms straight. Tim is able to act on an intuitive sense of what will work without understanding the rules that underlie the game's behavior. His response to SimLife-comfort at play, without much understanding of the model that underlies the game-is precisely why educators worry that students may not be learning much when they use learning software. (Turkle, 1997, p81)

2.5 Conclusion: A blended theoretical framework

The preceding analysis has provided a number of useful concepts that have been blended to form a theoretical framework of values to the current study. The blending does not produce a seamless theoretical framework, rather a way of shifting the focus to incorporate the child, the computer and the environment (peers, teachers and classroom). When any one of theses elements is in focus, the others fade a little into the background. Together, however, they provide a rich set of lenses through which to view the relationship between children and computers in the pre-school classroom. This approach takes up Cobb's (1994) challenge to abandon the 'quest for a one-size-fits-all' perspective.

In summary, the concepts that will shape the framework of the study are:

- Children as active in construction and determination of their own social lives (from theories of social constructivism and childhood studies).

- Both childhood and computers may have strongly influenced the children's social interaction (from cultural studies and childhood studies and computer as an evocative object)
- Levels of socio-cultural context-microsystem, mesosystem, exosystem and macrosystem with which the child directly or indirectly interacts (from ecological systems)
- Individuals and groups within the context being shaped by those individuals and groups (from theories of social constructivism and childhood studies)
- Individuals and groups within the context being shaped by the tools around them (from theories of social constructivism, childhood studies, and computer as an evocative object)
- Adults play an important role in the children's world (from theories of social constructivism and childhood studies)

Because these concepts come from a diverse range of differing paradigms and perspective, some seem to be in direct conflict with each other. However, it might be more useful to see these on a continuum, rather than as diametrically opposed. Livingstone and Gaskell (1995) who engaged in research on media in children's lives, also argue for transcending rather than perpetuating competing disciplinary orientations. Their framework focuses on interaction between a social conception of the individual and a structural conception of society that leaves space for the agency of both. In the particular blending put forward in this study there is sufficient commonality and consistency across perspectives to provides a rich integrated theoretical framework.

Chapter 3: Malaysia Education System

3.1 Introduction

Education is a priority concern of the Malaysian Government, and annually, the largest proportion of the national budget is allocated for education purposes. Primary and secondary school education is free for students between the ages of 7 to 17 (a total of 11 years of universal education). The admission age to the first year of primary school is usually seven and the graduating age for a first bachelor degree is about 22 years old. Over 97% of seven-year-old children are enrolled in the public school system. The Government is soon to make pre-school and primary education compulsory for all Malaysian children.

3.2 Geography and History in brief

Malaysia is a small country with an area of 329,733 square kilometres, strategically located in the heart of South-East Asia. The country comprises The Malaysian Peninsula, in the west (commonly called West Malaysia) and, Sabah and Sarawak in the east, the two regions being separated by the South China Sea. She shares the same border with the kingdom of Thailand to the north and is linked to the island of the Republic of Singapore in the South by the Johore causeway, while across the Straits of Malacca, the Indonesian island of Sumatra covers the length of her western horizon. Besides Sabah and Sarawak, there are twelve other states in Malaysia, all located within the penisula. They comprise Johore in the South, Melaka, Negeri Sembilan, Selangor, and the Federal Territory of Kuala Lumpur in the west, Perak Pulau Pinang, Kedah and Perlis in the north, with Pahang, Terangganu and Kelantan making up the east coast states.

Malaysia, which practices constitutional monarchy, inherited from the former colonial master a system of democracy governed by Parliament. It comprises of the 'Dewan Rakyat' (House of Representatives) and 'Dewan Negara' (Senate). While the Government is led by the Prime Minister, Malaysia has, as the Head of State the King, elected to the throne for a five year term by the other rulers of the states in the peninsula, headed by a 'sultan' or 'raja' (the reference used for the ruler depending on the state, for instance, Perlis is headed by a 'raja' and Kelantan by a 'sultan'). Melaka, Pulau Pinang, Sabah and Sarawak each are headed by a 'chief minister' while Kuala Lumpur is headed by a mayor.

In 2004 the population of Malaysia was 25.6 million. Malaysia's population comprises many ethnic groups, with the politically dominant Malays comprising a majority. By constitutional definition, all Malays are Muslim. About a quarter of the population is Chinese, who have historically played an important role in trade and business. Malaysians of Indian descent comprise about 7% of the population and include Hindus, Muslims, Buddhists, and Christians. About 85% of the Indian community is ethnically Tamil, with the remainder of Telegu, Malayalam, Punjabi and Gujarati descent. Non-Malay indigenous groups make up more than half of the Borneo state of Sarawak's population and about 66% of the Borneo state of Sabah's population. They are divided into dozens of ethnic groups, but they share some general patterns of living and culture. Until the 20th century, most practiced traditional beliefs, but many have become Muslim or Christian. The "other" category includes Malaysians of inter alia, Thai, European, and Middle Eastern descent.

The national language of Malaysia is Malay with English as its second language. Other languages spoken in Malaysia are Chinese (Mandarin, Hokkien and Cantonese), and Tamil, Malayalam and Hindi, used by the Indians. It is known that as far back as the 15th century there were communities of Indian and Chinese merchants, particularly in Melaka. Some of the Chinese settled there taking Malay wives. Their descendants, who generally married ethnic Chinese, spoke (and in the case of some older people still speak) a creole, Baba Malay.

3.3 The Malaysian School System

The school system in Malaysia is inherited from the British System, since the whole of Malaya (the old name of Malaysia) was under British colonial rule for over a hundred years until 1957 when Malaya became independent. It was under the British colonisation that the foundation of the present school system was set up (Wong and Ee, 1975).

Ensuring a sound education for all is the responsibility of the Federal government and most schools in the country are public schools. Malaysia provides 11 years of free schooling and approximately 18% of the annual National Budget is allocated for education.

Appendix II presents the development of the education system in Malaysian from the colonial period up to the present day.

3.3.1 The Present Malaysian Educational System

Generally, three types of schools can be identified in post-independence Malaysia: national, national-type and private. In national schools, the medium of instruction is the Malay language. While in the national-type schools, the Chinese language is used as the medium of instruction for national Chinese-type schools and the Tamil language for national Indian-type schools. For both types of school, Malay and English are compulsory subjects. Private schools are those with their own financial resources and do not receive any financial aid from the government. Despite there being different types of school, all must adhere to the national curriculum as well as to the prescribed schedule of national examinations set by the Ministry of Education.

3.3.2 National Education Philosophy

The Malaysian National Educational Philosophy, formulated in 1988, emphasises the development of all aspects of an individual - physical, spiritual, intellectual, social and emotional - in an integrated and holistic manner.

The National Education Philosophy states:

> Education in Malaysia is an on-going effort towards further developing the potential of individuals in a holistic and integrated manner, so as to produce individuals who are intellectually, spiritually, emotionally, and physically balanced and harmonious, based on a firm belief in and devotion to God. Such an effort is designed to produce Malaysian citizens who are knowledgeable and competent, who possess high moral standards, and who are responsible and capable of achieving a high level of personal well-being as well as being able to contribute to the harmony and betterment of the society and the nation at large (Curriculum Development Centre 1990: 6).

The National Education Philosophy clearly states that a good person should have a firm belief in and obedience to God; be knowledgeable; possess living skills; possess high moral standards; be responsible to himself, society and the nation; contribute to the well-being of society and nations; and have a balanced personality (Tajul Ariffin and Noraini 1992: 27). Promoting human resource development is one of the major thrusts of education and training programmes in Malaysia; thus, the programmes are expected not only to equip the younger generation with the necessary knowledge and skills but also to produce a responsible and balanced human resource with strong moral and ethical values.

Scrutinising the National Education Philosophy reveals that the development of high moral standards is an explicit preoccupation of the educational venture. Moral decadency among the younger generation urged the education policy makers to revisit the old national education mission dating from the Independence of Malaysia (1957) which overemphasised intellectual training and neglected moral development. Therefore, a new philosophy giving a balanced emphasis on the development of all domains was formulated. Moreover, the significance of the National Philosophy of Education can be better appreciated if it is seen in the context of the multicultural nature of Malaysia. Nik Aziz (www.hrea.org) argues that the significance of the National Education Philosophy in Malaysia in a multicultural context is to promote a consensus among various communities, and to develop a harmonious nation anchored in a firm belief in and devotion to God.

In summary, the above discussion revealed that, in the past, the British model had permeated and dominated the education system in Malaysia in terms of its structure, academic programmes, and assessment of standards; but in recent years, the trend is towards adopting many aspects of the American higher education system like the "unit/credit system", continual assessment, and multidisciplinary programmes. Despite the dominant influence of Western models in the system, efforts have also been made to link the development of education to the local social, political and economic context. One such effort is to change the medium of instruction from English to the Malay language throughout the whole education system. The International Islamic University for example, was established to strengthen cooperation and friendship among Islamic countries by providing facilities for Islamic studies, and training skilled human resources on the basis of Islamic principles. The stress is on the philosophical assumptions and beliefs of Islam concerning knowledge which is a radical attempt to breakaway from the dominance of Western knowledge (Selvaratnam 1989).

3.3.3 Educational Structure

The structure of the national educational system consists of pre-school, primary, secondary and tertiary levels as shown in appendix II.

3.3.3.1 Pre-school education

In the Education Act 1996, pre-school education was included in the National Educational System. Before that, the pre-school education was run by Non Governmental Organisations (NGOs) and private organisations. However, the Act does not institutionalise it. All programmes and activities of pre-schools must be based on the curriculum guidelines provided by the Ministry of Education (MOE). The aim of pre-school education as set out by the MOE is to enable pre-school children to acquire sufficient basic communication, social and other positive skills before enrolling at primary schools. The learning components included in the pre-school curriculum are language and communication, physical, cognitive development, moral and spiritual growth, socio-emotional development, as well as the aesthetic and creativite (Ministry of Education 2001b). Section 3.4 will discuss the development of the pre-school system in Malaysian in detail.

3.3.3.2 Primary education

Primary education is based on six years of schooling duration. At this level, the emphasis is on acquiring a strong foundation in the basic skills of reading and writing as well as building a solid foundation in mathematics and basic science. In primary education, emphasis is also on the development of thinking skills and values across the curriculum. (Ministry of Education, 2001). The core subjects at primary school level are the Malay language as the national language, the English language, the Chinese language for Chinese national-type schools, the Tamil language for Tamil national-type schools, Science, Local Studies, Islamic Education for Muslim children, and Moral Education for non Muslim children.

Primary school begins at six years of age, and may be completed within five to seven years. All types of primary school, irrespective of the medium of instruction, use a common national curriculum, the content of which reflects Malaysian identity. Each school conducts its own evaluation of a pupil's performance on a regular basis including weekly, monthly and termly tests. In addition there is a centralised national examination known as the Primary School Assessment Test or *Ujian Penilaian Sekolah Rendah* (UPSR).

3.3.3.3 Secondary education

Basically, secondary education level is an extension of the primary school education. It can be categorised into lower, upper and post secondary levels. Lower secondary school consists of three years of school duration (forms 1-3); two years of upper secondary school (forms 4-5); and a further two years of post secondary school (lower and upper six). The core subjects offered at the secondary level include the Malay language, English language, Mathematics, Science, History, Islamic Education for Muslim students and Moral Education for non Muslims students.

3.3.4 Curriculum Development

The National Curriculum as defined in the Education Regulation 1997 is:

> An educational programme that includes curricular and co curricular activities which emphasise all the knowledge or skills, norms, values, cultural elements and beliefs to help develop a pupil fully with respect to the physical, spiritual, mental and emotional aspects as well as to inculcate and develop desirable moral values and to transmit knowledge (Ministry of Education, 2001b: 1).

All of these aspects mentioned in the definition assist the holistic development of all human domains as well as instilling noble values and provide knowledge. This national curriculum is moulded in parallel with the National Philosophy of Education.

In the national context, the education curriculum aims to develop a united society and produce an efficient human resource to the country. The development of the curriculum is centralised under the jurisdiction of the Ministry of Education. Basically, three main departments are responsible for the design and development of the school curriculum. The Curriculum Development Centre (CDC) is responsible for the school curriculum from pre-school to upper secondary level.

3.4 Pre-school Education in Malaysia

3.4.1 Pre-school Background (The educational context)

In Malaysia, Early Childhood Education (ECE) generally refers to the period of a child's life beginning from birth to the age of six years when he or she enters to the formal school. On the basis of this, early childhood education can be divided into two phases. Under the first phase are children four years old and below. The educational needs of children in this phase are regulated by the Child Care Centre Act, 1984.

The second phase refers to children between five and six years of age. The educational needs of these children are provided by pre-schools (also known as kindergartens) which are currently operated by both the public and private sectors in the country.

In the public sector, the responsibility of providing pre-school services is borne by three agencies:

1. The Ministry of Education which can be considered as the lead agency,

2. The Department of National Unity under the Ministry of National Unity and Social Development which concentrates on urban and semi-urban areas, and

3. KEMAS (The Community Development Programme), under the Ministry of Rural Development which concentrates on the rural areas.

However, this discussion on Malaysian pre-schools will concentrate on the pre-school phase of ECE provided by the public sector. The tremendous development of pre-school education for so many years has resulted in it gaining an important position within the education system of the country despite of the fact that it has not received the fullest attention by the Ministry of Education in Malaysia due to its heavy commitment with other educational priority areas in the country. However, there is no doubt about the government's interest in and concern with pre-school education because more recently, through many of the agencies, the government has subsidised the establishment of more and more pre-schools throughout the country, particularly in the so called deprived areas. In relation to this, the Ministry of Education (2006) has announced that a total of (Malaysian Ringgit) RM327.3 billion was allocated for pre-school education development.

3.4.2 History of Malaysian Pre-school Education –Past and Present

The History of Malaysian pre-school education may be traced back to some thirty years ago. It started with the establishment of a number of pre-school bodies namely the Christian Mission and other private committees and individuals in the 1950s. They were mostly found in the western coast of the Peninsula of Malaysia. Initially, parents sent their young children to this institution to keep them occupied, out of mischief and under supervision for a few hours. In addition schooling in those days was, according to the thinking of many, a matter of purely intellectual development.

Parents were expecting their children to have books and to do homework. However, that concept changed as they realised that pre-school education is an opportunity for the child to develop his whole being in an atmosphere conducive to his physical, intellectual, social and emotional development.

In the 1960s there was a rapid expansion of private pre-schools in urban areas. The majority were run by untrained or former primary school teachers. The buildings and other facilities provided by these private bodies left much to be desired. This was largely because the funds came entirely from fees paid by the children. Public support in term of donations and government subsidies were negligible. During these years pre-school education was only available to children whose parents could afford the fairly high fees. This was inevitable because the majority of the pre-schools were run on a profit making basis and running costs were high.

The increasing interest in pre-school education and the realisation that pre-school education could help in the child's growth and development led the enlightened decision makers in the Ministry of Rural Development to formulate plans to extend pre-schools, especially for the under privileged in the rural areas. Thus effort was testified to by the starting of pre-school classes known as "Taman Bimbingan Kanak-Kanak" in many parts of the country. However the bulk of the expansion was in urban areas. To meet the increasing demands a number of bodies namely, the Religion Department, Armed Forces, Police Force, Custom Department, Women from United Malays National Organization, Churches and FELDA (Federal land Development Authority) in The Land Development Scheme took up the challenge to provide pre-school education.

It was not until 1971, that the Malaysian Ministry of Education made an effort to produce a guidebook for pre-schools throughout the country in response to a number of requests from those who were highly concerned about pre-school education. In April 1973, a workshop on pre-school education was held in order to study and discuss the guidebook and at the same time to make further recommendations and suggestions. This was the first of its kind ever held.

Realising the importance of pre-school education development in the country, more facilities and opportunities ought to be provided for all pre-school children in order to enable them to receive such education. It is regretted, however, that in the mean time the majority of pre-schools in Malaysia are apparently being monopolised by the well to do group because the fairly high fees have restricted the children of the low-income group from having the similar opportunity to learn. In relation to this, in 2001, the MOE and other relevant ministries had increased access to pre-schools. The MOE further improved education at this level by institutionalising it and making the National Pre-school Curriculum compulsory in all pre-schools beginning in 2003. All these efforts have contributed to an increase in the participation rate at this level from 64% in 2000 to 88.3 % in 2003 (Malaysian Educational Statistics, Educational Planning and Research Division (EPRD), MOE, 2003).

The increasing demand for pre-schools in Malaysia indicate their popularity and importance in the midst of the Malaysian Education atmosphere. In response to the many areas required for developing appropriate objectives for pre-school education from highly concerned quarters, the Ministry of Education has drawn up several general objectives as a guide for all pre-schools throughout the country.

In parallel with the social, political and economical development of the country, pre-school education also developed rapidly. The rapid development is illustrated in the number of centres and child enrolments. From 2,227 pre-school centres under government and private agencies in 1979, Malaysia has increased to 10,424 centres with 15557 classes in 1994. This comprises 48% of the children in the age group of 4-6). Currently there are more than 20 agencies involved in pre-school education, including the Ministry of Education, Ministry of Rural Development (KEMAS), Ministry of National Unity and Community Development (JPN), State Government (JAIN), semi-government bodies and private enterprises. In Fact, of the 597,973 children in pre-school in 1994, 165,307 enrolled in 1399 private institutions. According to Asiah (2001) "...... the total number of 6,960 pre-school centres in 1990, about 5,360 or 70% were run by government agencies and statutory bodies. These centres accounted for about 57% of the total enrolment. The number of children aged between four and five years enrolled in pre-school increased by 10% from 300,850 in 1985 to 331,520 in 1990, indicating the growing importance of pre-school education...." (Asiah 2001) Table 3.4-1 presents the pre-school children enrolment from 1997 to 2003.

The public pre-schools are fully funded by the government. The government pays for all expenses including teacher salaries, capital cost and equipment, food subsidies, and the cost of maintaining the premises. A monthly fee between RM5.00 and RM10.00 is collected from the children. This is generally used to defray other expenses relating to the operation of the centre. Pre-school classes conducted by the MOE and other government agencies enable under-privileged children in the urban and rural areas access to pre-school education for free or at a minimal charge. Priority for admission to these classes is given to those who could not afford to attend privately run pre-schools.

Table 3.4-1: Pre-school children enrolment from 2000 to 2003

Years	Children enrolment
2000	1 555 900
2001	1 573 400
2002	1 598 000
2003	1 680 300

In contrast, in private pre-schools, parents pay fees and the other expenses are borne by the operator/caregiver. Pre-schools organised by private enterprise are usually located in urban areas and provide early education mainly for children from middle class families who can afford the fees. The fees charged by these pre-schools vary and are largely determined by overhead costs and market forces.

Malaysia has a good policy for the support of pre-schools. The main strategy in ensuring high participation rate in public pre-schools is that the government, through various programmes, provides meals and other support facilities and services such as per capita grant allocation, pre-school activity packages, indoor and outdoor pre-school equipment and apparatus for pre-school education. The government through its agencies also provides trained teachers, teaching-learning materials, and funds to facilitate running of the public pre-schools.

3.4.3 Early Childhood Education Curriculum in Malaysia

The curriculum is something that early years practitioners work with everyday; both the formal curriculum and the informal curriculum that operates through early years settings. In the national context, the curriculum also prepares the children to become part of a united society and a human resource needed for the country. Malaysia's curriculum policy dictates that all schools irrespective of medium of instruction follow a common content curriculum for all and common public examinations from primary to secondary schools.

According to The National curriculum all the pre-schools must follow the National Curriculum as mentioned below:

> "The Minister shall prescribe a curriculum to be known as the National Curriculum which, subject to subsection (3), shall be used by all schools in the National Education System." (Education Act 1996, Sec.18)

Most of the pre-schools in Malaysia use Malay language as the first language in the school setting as mentioned in Educational act 1996:

> "The National language shall be the main medium of instruction in all educational institutions in the National Education System except a national-type school established under section 28 or any other educational institution exempted by the Minister from this section." *(Education Act 1996, Sec. 17)*

The national curriculum is developed centrally and within the Ministry of Education. Three main departments are responsible for the design and development of the school curriculum. The Curriculum Development Centre is responsible for the design and development of the school curriculum from pre-school to upper secondary. The provision for the establishment of pre-schools is enacted in the Education Act 1996. Pre-school programmes are undertaken by a number of ministries and agencies, including the private and voluntary sector. Curriculum guidelines of the MOE (Ministry of Education) serve as the base for pre-school education. Nevertheless, the agencies running the pre-schools are free to choose the medium of instruction to be used in their establishments.

Pre-school education aims at providing a firm foundation for formal education. All pre-school centres have to abide by the curriculum guidelines set by the Ministry of Education (MOE). The curriculum, which is in line with the National Philosophy of Education (NPE), enables pre-school children to acquire basic communication, social and other positive skills in preparation for primary schooling. Specifically, the aim of pre-school education is to develop children's skills in the following aspects:

a. Social skills,

b. Intellectual skills,

c. Physical skills,

d. Spiritual skills,

e. Aesthetic values (creativity and appreciation)

The social skill components focus on children's interaction with the environment and the people in their surroundings, development of positive self-concept, discipline, social responsibilities, and positive attitudes towards learning.

The intellectual skills components emphasise the physical environment, the concepts of space, numbers, alphabets, and prerequisites for writing, reading and language competencies.

The physical skills components focus on the physical activities that involve coordination of the various parts of the body such as the head, hand, leg, eye and fingers.

The spiritual skills components emphasise the inculcation of noble values and belief in God.

The aesthetical aspects on the other hand, train the children to express themselves through their hand-made creations, drawings, music and movements.

Previous studies by the MOE have established the importance of pre-schools in relation to overall achievement in the lower primary. A more recent study conducted by the MOE in 1995 and 1996 entitled, "The Impact of Pre-school Intervention on Primary 1-3 Pupils" showed in its preliminary report that pupils who had undergone pre-school education performed significantly better compared to their counterparts who did not have access to such benefits. Realising the importance of Pre-school education, the Government has placed pre-school education on the national development agenda. The Seventh Malaysia Plan 1996-2000 on education Programme notes that:

> Pre-school education will be further strengthened during the Seventh Plan to ensure participation of at least 65 percent of children in the 5-6 age groups. A comprehensive policy will be formulated for the development of pre-school education, covering major aspects such as curriculum, physical facilities and teacher training. With this policy, coordination and quality of pre-school education in the public and private sectors will be further improved. The private sector, including non-governmental organizations, will be encouraged to provide more pre-school facilities, particularly in the urban peripheries and rural areas. Effort will be undertaken to increase awareness of parents on the importance of pre-school education in their children's development. In this regard, greater parental involvement in the children's education will be encouraged (The Seventh Malaysia Plan 1996-2000).

3.4.4 Teacher Training

Most of the pre-school teachers have an academic qualification, the Malaysian Certificate of Education (MCE), an equivalent of 'O' level. There is also a variety of training programmes of different quality and levels. They are all aimed at providing knowledge and skills to institution-based teachers. All pre-school teachers undergo some form of training based on the training module established by the Ministry of education for this purpose. Pre-school teachers who are employed by the Ministry of Education are trained by the Ministry itself while those of the Ministry of Rural Development and the Department of National Unity are trained by their respective agencies. In the case of the Department of National Unity, each teacher undergoes 300 hours of basic training before being assigned to a centre. This training is supplemented by in-service courses conducted during the term and weekends. Pre-school teachers in the private sector are trained by private training institutions. The curriculum of the Ministry of Education is used by all government agencies and private training institutions. Admittedly, pre-school teachers with a degree in early childhood education are a rare breed in Malaysia. However, teachers with this level of qualification became a reality when the University Of Malaya launched this programme (Bachelor in Early Childhood Education) in June 1997.

3.4.5 Pre-school Layout

In terms of physical infrastructure, premises of all pre-school centres operated by public sector agencies are provided by the government. These could be either a building owned by the government or rented for the use of a particular centre.

Premises of pre-school centres operated by the Ministry of Education are more sophisticated. These centres are basically attached to existing primary schools and are hence referred to as annexes.

The layout of the pre-school buildings generally conform to standards set by the MOE. This standard requires a total area of 112.5 sq. metres for each class. Incorporated within this area are specific areas for learning, playing and other activities. The standard also emphasises security, safety and facilities which are child-friendly while ensuring that an educationally conducive atmosphere is maintained.

3.4.6 Teacher-pupil ratio

Teacher pupil ratio in the government pre-schools ranges from 1:20 to 1:25 but in the private pre-schools it can be as high as 1:35. Every private pre-school needs to be registered with the MOE for the purpose of monitoring (MOE, 1986).

3.5 The Growth of Demand for Technology in Early Education in Malaysia

Information and communication technologies are becoming more embedded and ubiquitous in the environment around children. These technologies are having such a profound effect on all aspects of people's lives that they are now becoming "taken-for-granted":

> Children today live in a communication-rich environment. The models of communication they encounter in their everyday lives include...a whole range of electronic and digital methods of communication...there are electronic forms of communication in the outdoor environment, in streets as cash machines or pedestrian crossings and in supermarkets and much more (Siraj-Blatchford & Siraj-Blatchford, 2003, p. 4).

It is highly likely that ICT will continue to be a significant presence in children's learning environments throughout their schooling and into their adult lives. In order to be full and capable participants in their environments, authors like Siraj-Blatchford and Whitebread consider it important that young children begin to develop "technological literacy". They define this as:

> ...a new form of literacy, but it is one that is increasingly considered to represent an essential curriculum entitlement in any broad and balanced curriculum for the twenty-first century (Siraj-Blatchford & Whitebread, 2003, p. 1).

During the past decade, Malaysia has been implementing a major effort to substantially up-grade the quality of education, as well as to improve the equity of its results. Major components of this decade-long reform effort are: comprehensive investment and support programmes which combine more resources with new teaching and learning methodologies; a new, more ambitious and contemporary curriculum aimed at developing higher-order thinking skills; and better salaries and working conditions for teachers. In terms of national policies, education has been the nation's top priority.

In the context of the Information and Communication Technology (ICT), it is the aim of the Malaysian government to integrate these technologies as learning and teaching resources for all students from pre-school to high level education.

In the pre-school context, as Malaysia moves towards becoming a knowledge-based economy (k-economy), it is imperative to equip the young with information and communication technology (ICT) knowledge through early exposure to the IT curriculum from the early stages of learning. Children need to be aware of the nature and uses of technology in order to meet the challenges presented by the present and future technological society. Many pre-school playrooms in Malaysia may now contain a computer (used by children throughout the sessions offered in the setting) although there is still a lack of developed pedagogy for the use of ICT in these contexts

Besides that, the Malaysian government also has gone a step further in ensuring that all pre-school children have access to quality pre-school education. In relation to this, all pre-schools whether private, government or quasi-government will be required to use the national pre-school curriculum which has been designed to help children acquire skills to prepare them for formal education.

3.6 Information and Communication Technology in Malaysian Schools: Policy and Strategies

Today, most countries include ICT integration, either in their national policies or in laws pertaining to the education sector. Malaysia is a developing country with an emphasis on the development of information technology. In the early eighties, computers were introduced to schools through the establishment of computer clubs. From then onwards, it has attracted interest in school children. The Malaysian government through the Sixth Malaysia Plan has decided to introduce computer studies as a subject in all secondary and primary schools. In October 1993, Prime Minister Datuk Seri Dr Mahathir Mohamad urged more schools to use computers as part of their teaching and learning process. In 1994, the Ministry of Education decided to further enhance computer usage in the learning process in the classroom by introducing computer literacy subjects into the curriculum.

In Malaysia, at the federal level, the government has set goals for schools in relation to ICT development. Besides that, Malaysia's aspiration of becoming a developed country embodies all that needs to be encapsulated about technologies and education in Malaysia. It was succinctly stated by the country's former Prime Minister, Dr. Mahathir Mohamad in 1991, the beginning of our thirty year journey toward 2020:

> "The ultimate objective that we should aim for is a Malaysia that is a fully developed country by the year 2020" (Mahathir Mohamad, 1991). It was further elaborated that we should be driven by "......brain power, skills and diligence, in possession of a wealth of information with the knowledge of what to do and how to do it." (Mahathir Mohamad, 1991).

Juxtaposing the above quote with education, it can be said that brain power, skills and diligence are qualities to be nourished through education. The wealth of information and knowledge which is always changing will certainly require technologies to access them. Furthermore the government wants students to leave school as confident, creative and productive users of new technologies, particularly ICT, as well as understanding the impact of those technologies on society. Schools are expected to integrate ICT into their operations.

Malaysia implemented the first computer system in 1966. Since then, the Government has introduced various initiatives to facilitate the greater adoption and diffusion of ICT to improve capacities in every field of business, industry, education, and life in general. These measures include the enhancement of education and training programmes, provision of an environment conducive to the development of ICT, provision of incentives for computerisation and automation, and creation of venture capital funds. Currently, Malaysia is in full gear to steer the economy towards a knowledge-based one. In July 2001, the Deputy Prime Minister announced that Malaysia's K-Economy Master Plan was in the final stages of formulation.

Malaysia also has a long-term vision, usually referred to as "Vision 2020" which calls for sustained, productivity-driven growth, which will be achievable only with a technologically literate, critically thinking workforce prepared to participate fully in the global economy of the 21st century. At the same time, Malaysia's National Philosophy of Education calls for "developing the potential of individuals in a holistic and integrated manner, so as to produce individuals who are intellectually, spiritually, emotionally, and physically balanced and harmonious." (Malaysia's National Philosophy of Education, 1998).

In order to support the country's ICT master plan and in line with the country's drive to fulfil Vision 2020, the education system has to be transformed. The catalyst for this transformation will be ICT-enabled Smart Schools. In addition to the Smart School project, the Ministry of Education is also attempting to reduce the digital divide that exists in the different parts of the country by providing computer laboratories to thousands of schools. Other ICT-related projects involve the training of teachers, school administrators and other school staff. Innovative projects like the use of electronic books and e-learning are also being piloted to ensure their feasibility before any roll-out to all the schools in the country. Non-governmental agencies are also very much involved in the drive to introduce ICT into schools.

3.7 ICT in Education

The Ministry of Education sees ICT as a means, not an end in itself. As such, all efforts are concentrated on developing new media as tools in the service of richer curricula, enhanced pedagogies, more effective organisational structures in schools, stronger links between schools and society, and the empowerment of disenfranchised learners. The Ministry believes that properly designed and implemented computing and communications have the potential to revolutionise education and improve learning as profoundly as information technology has transformed medicine, finance, manufacturing, and numerous other sectors of society. Technology is not seen as a "vitamin" whose mere presence in schools can catalyse better educational outcomes. Technology is also not seen as simply another subject in the curriculum, suited primarily for teaching students to use tools they may encounter as adults (Chang Foong Mae, 2000)

The concept of ICT in education, as seen by the Ministry of Education, includes systems that enable information gathering, management, manipulation, access, and communication in various forms. The Ministry has formulated three main policies for ICT in education:

i. The first policy is that of ICT for all students, meaning that ICT is used as an enabler to reduce the digital gap between the schools.

ii. The second policy emphasises the role and function of ICT in education as a teaching and learning a tools, as part of a subject, and as a subject by itself. Apart from radio and television as a teaching and learning tool, this policy stresses the use of the computer for accessing information, communication, and as a productivity tool. ICT as part of a subject refers to the use of software (e.g. AutoCAD and SCAD) in subjects such as "Invention" and "Engineering Drawing." ICT as a subject refers to the introduction of subjects such as "Information Technology" and "Computerisation".

iii. The third policy emphasises using ICT to increase productivity, efficiency and effectiveness of the management system. ICT will be extensively used to automate and mechanise work processes such as the processing of official forms, timetable generation, management of information systems, lesson planning, financial management, and the maintenance of inventories. (Chang Foong Mae, 2000)

Looking back, microcomputers started to revolutionise the delivery of education in Malaysia when the Ministry of Education initiated a computer in education project for Malaysian secondary schools in 1983. At that time twenty secondary schools were selected to participate in a project called 'An Introduction to Computers" (Abdul Rahman Abdullah, 1986). The purpose was to equip students with basic knowledge of computers and their applications. However, during the 80's the integration of computers into schools was not as intensive as it was in the late 90's. During the late 90's the government of Malaysia emphasised the importance and the role of information technology for national development. In fact, information technology has become a dominant feature of the National Policy. As emphasised in the Seventh Malaysian Plan (1996-2000), there will be a greater demand for workers with computer and information technology skills as a result of a greater use of information technology in the operation of both government and non-government organisations. Preparation of workers with knowledge and skills in computerisation begins in schools. At that point, computers became an important ICT initiative by the Government Agencies component of the school curriculum.

The Government is committed towards the use of computers in the delivery of education and as such a sum of Ringit Malaysian (RM) 12.5 billion was allocated to the educational sector in 1998. Table 3.9-1 presents the budget that was allocated to the educational sector from 1996 to 2005. The large budget allocation was intended for the initiation of the infrastructures development and training needed to prepare students for the information age. Currently, many schools have at least one computer with access to the internet. To emphasise the seriousness of the Malaysian Government in preparing knowledge workers, the government through the Ministry of Education has embarked on the project called the SMART SCHOOL project, whereby technology will be extensively used to support and enhance teaching-learning.

Table 3.7-1: The Financial Allocation for Educational Development 1996-2005 (Rohaty Mohd Majzub, 2003)

Programme	Seventh Malaysia Plan	Eighth Malaysia Plan
Pre-school	RM123.6.billion	RM147.4 billion

Primary school	RM632.0 billion	RM275.0 billion
Secondary school	RM5 330.1 billion	RM4 862.0 billion
Others	RM5 363.8 billion	RM8 900.0 billion

RM=Ringgit Malaysian

The Seventh Malaysia Plan (1996-2000) and Eighth Malaysia Plan (2001-2005) focused on expanding educational opportunities and increasing access to all levels of education, and on strengthening and improving the quality of education. The Seventh Malaysia Plan (1996-2000) attempted to improve upon the previous initiatives to meet the manpower needs of the nation, particularly in the fields of science and technology. Under the Seventh Malaysia plan, the objectives of education and training were to produce an adequate number of skilled and quality workers as well as to produce citizens, who are disciplined, possess high moral values and good work ethics. The Eighth Malaysia Plan (2001-2005) continues with the objectives of the previous plans and also gives high priority to reorienting the education and training system so that workers can acquire the knowledge, skills and expertise necessary to support a knowledge-based economy.

3.7.1 ICT Initiatives by Governmental Agencies

3.7.1.1 The Malaysian Smart School Project. (SSP)

The Malaysian Smart School was launched in July 1997 by the Prime Minister as one of the Multimedia Super Corridor's (MSC) Flagship Applications. The aim was to capitalise on leading-edge technologies and the rapid deployment of the MSC's infrastructure to jumpstart deployment of enabling technology to schools. This was done by creating a group of about ninety pilot schools in 1999 that were to serve as the nucleus for the eventual nationwide roll-out of Smart School concepts, materials, skills and technologies.

The aim of these Smart Schools is to help the country achieve the aims of the National Philosophy of Education as well as to foster the development of a workforce prepared to meet the challenges of the 21st century. Transforming the educational system entails changing the culture and practices of Malaysia's primary and secondary schools, moving away from memory-based learning designed for the average student to an education that stimulates thinking, creativity, and caring for all students, caters to individual differences and learning styles, and is based on more equitable access.

The Pilot Project is trial-testing the Smart School Integrated Solution, which involves the following main components:

1. Browser-based Teaching-Learning Materials (and related print materials) for Bahasa Melayu, English Language, Science and Mathematics

2. A computerised Smart School Management System

3. A Smart School Technology Infrastructure involving the use of IT and non-IT equipment, Local Area Networks for the pilot schools, and a virtual private network that connects the pilot schools, the Ministry's Data Centre and the Ministry's Help Desk

4. Support services in the form of a centralised Help Desk, and service centres throughout the country to provide maintenance and support specialised services such as systems integration, project management, business process re-engineering, and change management.

The creation of The Smart School System serves as the benchmark for ICT integration into schools (http://www.mdc.com.my/msc/flagship/ss.html, accessed on 25 June 2005). The Malaysian Smart School programme is aimed at reinventing the teaching-learning process and promotes creative and critical thinking among students through the extensive use of technology, the Internet and multimedia courseware, preparing children for the information Age. Currently, 90 schools have been transformed into SMART SCHOOLs. The Ministry of Education in Malaysia intends to have all its 10,000 schools in Malaysia to be renowned as a Smart School by the year 2010.

The focus of The Smart School System, as elaborated by the Ministry of Education, is to produce 'smart learners' – those who are creative, capable of generating new information; those who are thinkers and not merely regurgitators of knowledge and who when faced with a novel situation will be able to analyse, consider various options and make informed decisions (Ministry of Education, 1999: 9). The innovation of SSP has changed the teaching and learning environment in schools including the curriculum, pedagogy, assessment, and teaching-learning material. The curriculum of the SSP puts an emphasis on seven learning areas; language and communication, science and technology, social studies, physical and health development, vocational and personal awareness, practical and creative arts, and noble values development.

The success of The Smart School System, however, greatly depends on its stakeholders such as teachers, headteachers, education officers, support staff and parents. They must be trained professionally in the necessary knowledge, skills and perceptions in order to fulfil their roles. Other necessary infrastructures of The Smart School System are multimedia courseware, presentation facilities and email, as well as library/media centres and computer laboratories to facilitate learning and the teaching process in the classroom. Apart from teaching and learning, technology also provides a bridge between parents, students and society. In addition, it makes communication more effective and easier among teachers, students and parents.

However, there are several questions arising along with the aggressive implementation of ICT in schools. Among these is the role of teachers as the educator and model for children. In terms of infrastructure, the project invariably makes heavy demands on investment for multimedia infrastructures. The question is, apart from government national schools, are the private schools able to equip their schools with multimedia infrastructures? Teacher training is also another question; most teachers need re-training to change their mindset about ICT for teaching and learning and to upgrade their skills in ICT.

3.7.1.2 Internet Usage

A website, MySchool Net, was set up by the Ministry of Education to help increase the use of ICT in education. This website provides links to readily help teachers and students access educational information.

The Ministry also encourages interactive communication between Malaysian school children and students from other countries. An example of such a project is the Ministry of Education – British School Link Project which enables students from four schools in the Klang Valley to exchange e-mail and video-conferencing with their peers in four Coventry schools in the United Kingdom.

3.7.1.3 ICT Training In Schools

The Ministry of Education recognises that training is a vital aspect in the implementation of any project. The model that the Ministry uses to disseminate training is the cascade model. Selected master trainers undergo training, and they pass on this training to selected trainers, who in turn, train their colleagues at school, district, or state level.

Various agencies within the Ministry of Education conduct training, for instance, the Teacher Education Division handles the pre-service and in-service training of teachers, while the Institut Aminuddin Baki conducts training for heads of schools and other school administrators. Orientation courses are also conducted by the Educational Technology Division, the Curriculum Development Centre, the Examinations Syndicate, to name a few. In addition, the State Education Departments, the State Educational Resource Centres, and the Teacher Activity Centres also conduct specialised short-term courses.

To date, the Teacher Education Division has trained at least 55,000 teachers in the last few years. About half of these teachers went through in-service training, while the other half were teacher trainees trained in the Teacher Training Colleges. It is now a requirement that all teacher trainees at the Teacher Training Colleges be exposed to ICT literacy, and the use of ICT in pedagogy.

The Curriculum Development Centre also trained a number of teachers in conjunction with the Computers in Education Programme. This programme started as far back as 1992, even before the introduction of the Smart School. The programme focused exclusively on ICT literacy at first, but in the last few years, the emphasis has shifted to getting the teachers to use ICT in the classroom during lessons. Six hundred and thirty six primary and secondary schools, the majority of which were rural schools, were involved in this programme. More than 3000 teachers and about 260,000 students benefited from this programme.

Nonetheless, all the figures mentioned above do not take into account those teachers who have obtained diplomas or degrees in computer science and other ICT fields. The figures also do not include those teachers who have been trained at school, district, or state level. The figures exclude ICT-savvy teachers who have learnt on their own as part of their on-the-job responsibilities. And lastly, the figure focused do not include the ICT training for the pre-school teachers. Therefore, this research study also focuses on how teachers adapt the curriculum to incorporate the use of the computer into pre-school activities.

3.7.1.4 The Computerisation Programme in Schools

The Government is aware of the various disparities and gaps which need immediate attention and action before ICT aggravates the situation. In order to narrow the digital divide, the Government has focused its attention on the education sector to increase the ICT literacy of the young population. It has introduced the use of personal computers and ICT for children at an early stage of their education as part of their school curriculum.

To increase ICT literacy in schools, the Computer-in-Education (CIE) programme was introduced, whereby a total of 90 secondary and 20 primary schools were provided with computer laboratories. The Computer-Aided Instruction Programme for Mathematics and English was expanded to 35 primary schools. At the secondary school level, computer literacy was introduced as a subject for students in Remove Class and Form One as well as a co-curriculum activity for Form Two and above. For the secondary technical schools, students were taught designing and programming using software such as Computer-aided Design/Computer-aided Manufacturing (CAD/CAM). In public institutions of higher learning, campus-wide networking systems based on a high-bandwidth fibre optic backbone were installed to provide facilities for multimedia applications in distance learning and communication.

From 1996 to 1998, a total of 1,230 teachers were trained to conduct the CIE programme in schools. Technical teachers were also provided training in CAD/CAM for designing and programming. In addition, all teacher training colleges were provided facilities for computer training. The Smart Teacher Training Programme was also launched for 479 resource teachers involved in the smart schools initiative to provide them with greater understanding and knowledge of IT applications.

The Government has indicated that computer education and training programmes would be further intensified and expanded during 1999-2000. Initially, this involves providing 222 primary schools and 110 secondary schools with computers to enable them to conduct the computer literacy programme. From 2000-2006, a total of 33,387 teachers have been trained to conduct the CIE programme in schools. As the technology that drives IT and multimedia, changes rapidly, content of the training programmes will be revised from time to time to meet the skill requirements and increasing demand for ICT personnel. New skills such as information and knowledge management as well as programme application will be incorporated into the education and training curriculum. The Government will continue to invest in computers and related infrastructure to ensure students have a wider access to IT applications and knowledge. In addition, more pre and in-service training will be provided for teachers to enhance knowledge.

3.7.2 ICT Initiatives by Non-Governmental Agencies

3.7.2.1 The Chinese Smart Schools

The project aims to set up computer laboratories in more than 100 selected Chinese stream primary schools throughout the country, for the purpose of ensuring ICT literacy of school staff and students. The project also involves the use of selected courseware for classroom pedagogy.

3.7.2.2 Private Smart Schools

The Smart School concept is no longer considered a fashionable luxury but the only way forward. This is evident by the adoption and adaptation of the concept by at least three private schools in the Klang Valley. These schools have incorporated multimedia technology and worldwide networking, in addition to using ICT as part of the teaching-learning environment and as a subject proper.

3.8 Conclusion

Since Malaysia's independence in 1957, education has always figured prominently as an integral part of the government's developmental policy. The education sector has undergone tremendous changes and developments over the years. Recent reforms in education are driven by the need for Malaysia to have an education system on par with the best in the world. This is pointed out as the mission statement of the Ministry of Education: "to develop a world class quality education system which will realize the full potential of the individual and fulfil the aspiration of the Malaysian nation." (MoE, 2001). The rapid growths in the use of the computer and computer-based technologies during the past two decades have similarly had an impact on the Malaysia educational system. Malaysia, as a developing country, has had to accelerate change to achieve a significant transformation of its educational system in order to meet the needs of workers in a technologically competent and scientifically adept society. Malaysia, therefore, primed the educational system to enable the education of a pool of well-educated, highly skilled and strongly motivated professionals The Malaysian government is aware that the society needs to be empowered with information so that a knowledgeable and intelligent society, which is essential for k-economy, could be nurtured, and achieved in the long run. Thus, as Malaysia moves towards becoming a knowledge-based economy (k-economy), it is imperative to equip the young with information and communication technology (ICT) knowledge through early exposure to the IT curriculum from the early stages of learning.

Chapter 4: Literature Review

4.1 Introduction

Interest in using computer technology as an instructional medium with young children is growing around the world. Many parents, teachers, and even national governments are convinced that early interaction with technology stimulates learning and gives children a head start on success in the technological world of the future. This study investigates pre-school children's social interactions when they use the computer in pre-school classrooms. Therefore, this chapter provides a review of literature on the use of computers in education, use of computers in early year's education, and literature review of what research has already been carried out on computer use by children in pre-school education or general computer use by children under the age of 5 or 6.

4.2 The Child

There is some variation across countries in the ages of children considered to be in early childhood education. According to Swiniarski, Breitborde, & Murphy (1999), the definitions of early childhood care and education differ around the world. The more industrialised nations consider early childhood to be the period from birth through to age 8 (Essa, 1999; Wortham, 2000), while developing nations focus on birth through to age 6 (Eville-Lo & Mbugua, 2001; UNICEF, 2002). Graves et al (1996) stress that regardless of such determinations the increased interest in early childhood education around the world reflects respective nations' and/or societies' particular philosophical beliefs about children.

In the United States and Canada, children start school at age 6. Nursery schools generally cater for children aged 3–5 years old, and kindergartens cater for children aged 4–5 years old. In England, Scotland, and Wales, children in nursery schools are normally aged between 3 and 5 years, and in Northern Ireland, between 2 and 4 years. In England and Wales, some schools have classes called "reception" classes for children who have not yet reached the compulsory school age (5 years old). Sweden has pre-schools for children aged 0–5 (förskola) and another pre-school for 6-year-olds (föreskoleklass). In Malaysia, Kindergarten or pre-schooling is compulsory for 6-year old children. Pre-school (Pra sekolah) institutions of this country are often known as Tadika (Taman didikan Kanak), Tabika (Taman Bimbingan Kanak-kanak), Nursery, Kindergarten etc. They all follow the National Pre-school Curriculum (Kurikulum Pra sekolah Kebangsaan).

Woodrow (1999) stated that children and childhood have been viewed from three dominant perspectives: that of the child as the 'embodiment of evil', as 'innocent' and as a 'miniature adult' (Woodrow, 1999). These three dominant images: the child as evil, the child as innocent and the child as a miniature adult have persisted through the centuries and can be seen in recent and current practices. John Locke (1632-1704) challenged the idea that the children were innately evil, or innately anything for that matter, arguing they were merely a product of their environment. Locke introduce the concept of blank state, a 'tabula rasa', which means that the child had no inborn ability to influence his or her development, that only the environment could determine the outcome. Locke saw the children as a passive recipient of experience rather that someone with specific tendencies to think or behave one way or another. The child as evil is reinforced by rules and disciplinary practices meant to keep children 'in line', such as mandated behaviour and dress codes and forms of classroom grouping based on behaviour management issues (Woodrow, 1999). Research from this perspective positions children as "objects" to be studied for the purpose of finding methods to achieve conformity and ease of teaching practice.

However, in the 18th century, instead of 'evil' children who must be moulded into responsible adults came a new notion of childhood innocence. According to this view, children were born pure and naturally good and any wrongdoing could be attributed to the corrupting influence of adult society. Jean Jacques Rousseau (1712-1778) expounded his theories on how he thought children should be educated. His view was very different from those who saw the child as evil or as a blank state. He argues that they needed a natural environment where they could develop at their own pace. Rather than constantly guiding or correcting children, Rousseau advocated allowing them to develop naturally, with minimum adult supervision. The view of the child as innocent has dominated early childhood pedagogy for more than a century, beginning with Froebel's late 19th century notion of the Kindergarten or garden of children, where children were seen as seeds to be planted and cultivated (Branscombe et al., 2000; Morrison, 2001). According to Morrison (2001), the behaviourist movement of the early 20th century also assumed the view of the child as innocent and a blank state, able to be moulded to adult standards through forms of reinforcement. In research, this image of the child once again denies children a voice, allowing adults to speak and give consent on their behalf (Fasoli, 2001). While the Industrial Revolution promoted the image of the child as miniature adults, with children made to work long hours in mines and factories in harsh and unrelenting conditions (Branscombe et al., 2000), the image did not die with the 1930s enforcement of child labour laws, but is apparent in educational practices today (Woodrow, 1999).

Another image of childhood has also emerged, largely through the work of the Reggio Emilia movement in Italy and through the 'new sociology of childhood' (James & Prout, 1990, in Corsaro, 1997). Corsaro (1997) stressed that, in this image, a child is looked at as a capable and competent agent who appropriates and reproduces aspects of their culture through interaction with others. This approach rejects the view of the child as passive and innocent (Fasoli, 2001; Woodrow, 1999), asserting that childhood innocence is a socially constructed phenomenon (James & Prout, 1990, in Corsaro, 1997) that limits the opportunities we give children to explore and develop in the 'real world'. It reconceptualises childhood as a period of active participation in, and of making meaning of, new experiences.

Woodrow (1999) expressed that the agentic child is seen as possessing capabilities and competencies to meet new challenges with curiosity and motivation, not unlike those of older children or adults. In this framework, adults, teachers, parents, researchers, are constructed as co-learners who negotiate, challenge and guide through reflection on their own experiences, values and practices, and who share power with children.

In addition, Cristensen and Prout (2002) outline four ways that children and childhood have been identified in research: the child as object, the child as subject, the child as social actor and the child as participant/co-researcher. From the perspective of the child as object, children and young people are seen as dependent, incompetent and not able to deal appropriately with information. This orientation research relies heavily on adult accounts and adult perspectives. The second position views children as subjects, putting more into the foreground of the research process and orienting this towards a child-centred perspective. In the third perspective of children as social actors they "act, take part in, change and become changed by the social and cultural world they live in" (Cristensen and Prout, 2002:481). This research approach does not necessarily make a distinction between adults and children and there is no automatic assumption that methodologies will need to be adapted according to age or that different ethical standards will apply. The fourth research perspective is concerned with children having an active participant role in the process of the research (Thomas and O'Kane 1998; Clark, 2004) building on the UN Convention of the Rights of the Child (General Assembly, 1989) recommendation that children should be informed, involved and consulted about all activities that affect their lives, including research.

Viewing the child as capable, competent (Carsoro 1997) and taking an active participant role (Cristensin and Prout, 2002) in the research has a number of implications for early childhood pedagogy and research. This study focuses on the area of research with young children, using the notion of the child as agentic, or capable, competent and in an active participant role. From these perspectives, research is seen as implemented with children rather than about them. Power is negotiated between the researcher and child participants in data collection (Fasoli, 2001), and children's voices are also given serious consideration in the interpretation of the data to make meaning of the research questions.

4.2.1 Children and Play

Bundy (2001) noted 'there is little agreement and much ambiguity about virtually every aspect of play, from its definition, to its purpose, to the ways in which it manifests itself' (p. 89). Play has also been defined as exploratory in nature, and consisting of a variety of activities that involve movement and manipulation in relation to the environment (Robinson, 1977; Sutton-Smith, 1996). Bundy (2001) described play as a transaction between the individual and the environment that is intrinsically motivated, internally controlled and free of many of the constraints of objective reality.

Scales, et al (1991) called play as an "absorbing activity in which healthy young children participate with enthusiasm and abandon". Csikszentmihalyi (1981) described play as a subset of life "an arrangement in which one can practice behaviour without dreading its consequences". Garvey (1977) described play as an activity which is 1) positively valued by the player; 2) self motivated; 3) freely chosen 4) engaging; 5) which "has certain systematic relations to what is not play".

4.2.2 Theory of Play

Over the past two centuries, theories of play have contained explanations of play and reasons for its existence. As an aid to understanding the phenomenon of play, an overview of play theories is given below.

Play theories are divided into classical theories of play and modern theories of play (Mellou, 1994). Classical theories of play originated in the nineteenth century and try to explain the existence and purpose of play (Mellou, 1994). Modern theories were developed after 1920 and these theories attempted to explain the role of play in child development.

Table 4.2-1: Play theories

Theory name	Summary of theory
Classical theories:	
Surplus Energy Theory (Spencer, 1878)	Play occurs because children have excess energy
Recreation or Relaxation Theory (Lazarus, 1883)	Play occurs because children need to restore their energy or relax
Pre-exercise Theory (Groos, 1985)	Play is a product of an evolutionary biological process. It emerges from instincts and exercises. Play serves an adaptive purpose because through play the child constructs the adaptive skills they will require through life.
Recapitulation Theory (Hall, 1920)	Play is a product off an evolutionary biological process. Through play,

	primitive instincts are weakened. Play development follows the evolutionary development of the human race.
Modern theories:	
Arousal Modulation Theories of Play (Berlyne, 1960; Ellis, 1973; Hutt, 1985)	Play is associated with exploration. Exploration of objects reduces the level of arousal when novel situations are encountered. When the organism is bored, arousal is increased by exploration. Play was seen as stimulus seeking behaviour. Eventually, these theories led to the distinction between exploration and play. Exploration occurred in novel situations where the child asked "what can this object do?'. Play occurred in familiar situations where the child asked 'What can I do with this object?'
Psychodynamic Theories of Play (Freud, 1961; Erikson, 1985)	These theories explain the role of play in the emotional development of children. Through play, children can play out with fulfillment and master traumatic events in their lives.
Cognitive Developmental theories of Play (Piaget, 1962; Vygotsky, 1966, 1997)	Play is a cognitive process. Play is a voluntary activity. Play contributes to cognitive development, problem solving, and creative thought. Play develops innovation, flexibility, enhanced problem solving and adaptation.
Socio cultural theories of play:	
Play as socialisation (Mead 1934)	Through play with other children, children learn social rules and norms. Social roles are practiced through play.
Metacommunicative theory (Bateson, 1995)	Play itself is the skill required to function within the real work of daily life. Children frame and reframe roles themselves. Play is learning about learning. Play is affected

	by the context in which it is played. Children signal that they are playing and play is not an agent of socialisation which develops skills for adulthood.

Table 4.2-1 presents four classical theories and five modern theories of play. This table is based on Mellou's categorisation of play theories and also includes modern theories of play and Parham and Primeau's (1997) subcategories of socio cultural theories of play. Two conclusions can be drawn from Table 4.2-1. The first is that the concept of play has varied widely over the past two centuries, and the second is that how play is perceived has direct implications for the value ascribed to play in child development. For example, Ellis (1973) suggests Arousal Modulation Theories of Play. He uses competence motivation and arousal-seeking to understand play. According to arousal–seeking theory, human beings engage in continuous information-processing activities. Lack of stimuli in an individual's environment creates discomfort, directing him or her to increase any available perceptual information either by seeking it externally or by developing it internally. An overabundance of stimulation can influence individuals to "turn off" their surroundings by attending less to them. Through play, children mediate any available stimulation to fulfil an optimal arousal level.

Secondly all these theories collectively justify children's play as an educational activity. Children participate in a play activity in a natural way. Play helps them to understand cognitively and effectively and express their thoughts and feelings about the world. Through play children gain a feeling of control and command over features of their environment.

4.2.3 The Importance of Play in ECE

The role of play in the early childhood education curriculum has shifted over the years. Friedrich Froebel (1782-1852) who originated the kindergarten over 150 years ago, valued play as an important component in children's development and used play in the programme he developed. His curriculum included using manipulative materials (gifts) such as balls, wooden blocks and others materials and craft activities (occupations) such as paper weaving, paper folding and cutting, sewing and others art activities. These items symbolised Froebel's fundamental concepts about the unity of the individual, God and nature.

At the beginning of the twentieth century, Maria Montessori developed a very different early childhood curriculum-the Montessori Method (Montessori, 1965, 1973). Maria Montessori abstracted the essential elements of her method from the natural play activities of children, reconstructing and systematising them. When developing her methods, she brought materials that she was designing into the classroom and watched children play freely with them. She then abstracted what she considered to be the essential elements of the play and systematised their use in her method. Children's free play with the Montessori materials was discouraged after she had decided how materials could best be used (Montessori, 1965).

Although both the Froebelian kindergarten and the Montessori method were based on observations of the play activities of children, the educational methods they derived from play were quite distinct from each other, because they had different views about the nature of knowledge and the aims of education. Froebel was an idealist; he used materials and the activities of his kindergarten to help children gain the abstract ideas and spiritual meanings he had selected them to symbolise. By using Montessori materials, children could sharpen their abilities to gather and organise their sensory impressions in order to better absorb knowledge. In both instances, the activity that was embodied in these early childhood educators' methods was abstracted from play, though many of the qualities of children's free play were eliminated.

John Dewey (1859-1952) rejected Froebel's notions of play. John Dewey's (1916) view of children's learning was the basis for the contemporary perspective on the educational use of children's play. Dewey broke from earlier views of children's play activities that were rooted in colonial times, when adults admonished children "to avoid the frivolity of play" in order to become more work oriented as they matured (Hartley & Goldenson, 1963). According to Dewey (1916), an education for young children was embedded in their experience and in the world surrounding them. Play was used to help children reconstruct their experience in order to function at higher levels of consciousness and action (Dewey, 1900). He thought play could be used to help children reconstruct their experience and to gain meaning from it. By playing, Dewey thought they would learn to function at higher levels of consciousness and action (Dewey, 1900). Play was not to be a totally free activity, however. Rather, teachers were to create an environment to nurture play that would support desirable mental and moral growth in children (Dewey, 1916).

Contemporary early year's educationalist, notably Moyles, Bruce and David, reinforce the values of play and their work develops that of the classical theorist by placing it in a contemporary context. Moyles (1994) believes that it is practitioners who are best placed to observe and channel the value of children's play into powerful contexts for learning. She points out that the child will play with or without adult approval. Thus adults should gain a sound understanding of play and encourage it in order that its harsher elements do not manifest themselves later on in such antisocial activities as vandalism. Moyles (1994) argues that if young children's learning is founded in play, not only will they be happier in the present but they are far more likely to be well balanced, rounded and fulfilled adults in future society. Play, she argues, is a social construct, which is essential to a balanced society.

Bruce (1994) examines what she calls 'free-flow' play and evaluates its contribution to children's learning. Bruce argues that the intelligence of children who have enjoyed sustained experience of 'free-flow' play will fit them far better for adult life than the highly controlled experience of a formal early years education. David (in Nutbrown, 1996), like Bruce, questions whether or not children's inalienable right to play is being denied by the increasing emphasis on formal education in the early years. She quotes Article 31 of the UN Convention on the Rights of the Child, which sets out requirements for children including 'rest and leisure to engage in play and recreational activities appropriate to the age of the child' (Nutbrown, 1996:90).

The contemporary perspective, as illustrated by Moyles, Bruce and David, places a strong emphasis on the benefits of play in preparing children to take their part in a healthy society. It is fearful of the consequences of the reduction of play and the increasing amount of formal learning on children's development and, later, the adult they become.

Recognising the importance of play, the Malaysian Ministry of Education has made play an integral part of the pre-school curriculum. The National Pre-school Curriculum, implemented in 2003, lists learning through play as a pre-school teaching and learning strategy. Learning through play recognises the need for an informal, activity-oriented approach to pre-school education that addresses the learning needs, styles, and development of children from four to six years old.

In response to concern about the educational consequences of early childhood programmes, there have been numerous studies of the consequences of various educational approaches, including the outcomes of young children's play. A review of the definitions of play and play theories, along with an analysis of the ways that teachers have used play to further educational objectives, is useful for understanding play in early childhood education. As Anning (1999:129) puts it,

> "Early Years educators have always set a high value on children's ability to learn to play".

The importance of the role of play in the social, emotional, and physical development of pre-school-age children has been generally established in the research literature and is considered by early childhood professionals to be an integral component of a developmentally appropriate curriculum (Bredekamp & Copple, 1997; Pellegrini, 2002). Play has been identified with several valuable functions in young children's learning and is not considered to be merely a pleasurable waste of time. For example, (Garvey (1990, p. 9) points out that:

> "Research on the growth of social competence, readiness for formal schooling, and the ability to cope with intrapersonal and interpersonal affect; on family relationships and processes; and on the problems of handicapped, disturbed, or developmentally delayed children have frequently involved studies of play activities or identified play as a positive influence in other areas of development."

The significance of play to children's social development is emphasised by Vygotsky (1978), Bruner (1972), Moyles (1989), Bruce (1997) and David (1999) who agree that the contribution of play to children's social competence is critical. There is clear and widespread support among current researchers for Vygotsky and Bruner's socio-constructivist theories of play. For centuries, researchers and scholars have been studying children's play and the unique opportunities that it provides for cognitive and social development. Children's play is considered a form of `social behaviour', because children engage in several social situations such as co-operation, assistance, sharing and solving problems in appropriate ways. In these situations, children acquire social skills and learn about their social world, such as the adults' and their playmates' points of view, morals, social skills and conceptions of friendship (Saracho, 1986a).

Children's social interactions with their peers contribute to their cognitive development (Saracho, 1986a). When young children play, they undergo a variety of experiences (Saracho, 1985b). During play, the time surrounding important incidents (e.g. an entire reality might take place within minutes) decreases, although it permits children to understand, rehearse and evaluate relationships with others in each incident (Stambak & Sinclair, 1993). Rubin et al. (1998) hypothesised that for early childhood social interactions is:

> ...competent entry into ongoing peer activity appears to involve the ability to observe what the play participants are doing (on looking activity), to approach and play beside potential play partners (parallel play), and, finally, to engage the players in conversation about the ongoing activity. As such, a simple consideration of the frequency of particular forms of social participation masks the functional significance of the behaviour (p. 635).

Numerous studies (Erikson, 1963; Howes & Stewart, 1987; Pellegrini, 1984; Piaget, 1962; Rubin, Maioni, & Hormung, 1976; Sutton-Smith, 1997; Vygotsky, 1978) indicate that play with others gives children the opportunity to match their behaviour with others and to take into account viewpoints that differ from their own. Thus, play provides the rich experience children need to learn social skills; become sensitive to others' needs and values; handle exclusion and dominance; manage their emotions; learn self-control; and share power, space, and ideas with others. At all levels of development, play enables children to feel comfortable and in control of their feelings by: 1) allowing the expression of unacceptable feelings in acceptable ways and 2) providing the opportunity to work through conflicting feeling.

Jones (2004) stressed that, when playing, children demonstrate and develop capacities, skills and ideas which are not in themselves play. Gross (1998) argued that the purpose of play is to create opportunities for children to practise future life skills such as perseverance, compromising, engaging in social discourse, taking the lead and co-operation. What is clear is that observation of children at play informs the adult that children engaged in it are making sense of the world around them. This conclusion is reinforced by the realisation that children's play replicates adult's language, social discourse, attitude and commom interactive situations with a great deal of accuracy and a discormfiting degree of percipience (Jones, 2004).

However research carried out by Bennet et al. (1997) found that despite practitioners' strongly expressed belief in the centrality of play to the learning of young children, it is not prominent in pre-school setting. Bennet et al. suggest that the absence of a single theory of play has made it difficult for practitioners to articulate why it should be included in the curriculum.

The above disscussion clearly showed that play has a serious implication for children's development. Therefore the interest of the study was also to examine the impact of play with computers on the social interaction behaviour of pre-schoolers.

4.3 ECE and Information Communication Technology (ICT)

Siraj-Blatchford & Siraj-Blatchford (2003) defined ICT as "anything which allows us to get information, to communicate with each other, or to have an effect on the environment using electronic or digital equipment". Information and communication technologies (ICTs) are valuable tools for learning, with computer technology playing a central role in education. Children are becoming exposed to computers and technology at an increasingly early age, but most of this technology has not yet been fully integrated to make child–computer and child–child interaction optimal (Crook, 1995).

The situation of early childhood education practitioners grappling with the introduction of ICT into their centres, and learning how to make the best use of them with children, is a common theme in the literature. Most of the literature about ICT in early childhood education strongly supports the view that technology on its own should never drive the process of ICT development in the sector (Downes &

Fatouros, 1995), rather, all planning for the introduction and use of ICT by children and adults in early childhood education should be grounded in a clear understanding of the purposes, practices, and social context of early childhood education (O'Hara, 2004; O'Rourke & Harrison, 2004; Sheridan & Pramling Samuelsson, 2003). Brooker (2003) has suggested that, at least in the UK, early childhood education may actually be leading the way in developing best practice in the use of ICT to support positive learning experiences for children. Compared with the school sector:

> ......there is increasing evidence that some of the most exciting and appropriate uses of ICT are to be found in early years settings, where there is less pressure to meet strict targets and more opportunity to experiment with child-centred practice...(Brooker,2003,p.261).

There is now a strong focus on the development of ICT policy, and intergration of ICT in curriculum and practices across the whole education sector. In most countries, policy and curriculum support for the development of ICT in the ECE sector have lagged behind that given to the school sector (O'Hara, 2004; Sheridan & Pramling Samelsson, 2003; Stephen & Plowman, 2003). One of the main problems when considering the use of technology in education is that computer activities are often still an "add-on" to regular school work or based around structured software in an attempt to enhance and extend curriculum topics. Instead of being a catalyst for change, new technologies have been in the main mapped on to old curricula that were conceptualised in a different time. It has been noted (Thinker, 1999; Yelland, 1999, 2002) that we have a great deal of information about the ways in which new technologies are able to transform learning, yet curricula in schools remain much as they were last century. Studies from countries including Australia (Cooper, Farquhar, & McLean, 2001; Downes et al., 2001), Finland (Kankaanranta & Kangalasso, 2003), the UK (O'Hara, 2004), Scotland (Learning and Teaching Scotland, 2003a), and New Zealand (Bain, 2000) suggest that in many early childhood education settings, ICT use is minimal, and early childhood education practitioners are uncertain about the value of ICT, or how it could contribute to their practice.

In addition, the use of ICTs also raises a whole series of questions ranging from the appropriateness of the 'chalk and talk' paradigm, through the role of assessment, to the need to cater for different learning styles. Holmes and Gardner (2006) expanded the definition of social constructivism that takes into account the synergy between the more recent advances in information technology - which are increasing the potential for communication and the ability to store a variety of data types - and advances in virtual learning environments. They introduced the concept of 'communal constructivism', by which they mean an approach to learning in which students not only construct their own knowledge (constructivism) as a result of interacting with their environment (social constructivism), but are also actively engaged in the process of constructing knowledge for their learning community.

However, this situation is beginning to change. Some countries, like Scotland, have recently developed ICT strategies for the early childhood education sector (Learning and Teaching Scotland, 2003b). In Australia, the changes in curricula have been achieved through the conceptualisation of a new basics curriculum in Queensland, and the essential learning's framework of both Tasmania (Department of Education, Tasmania, 2003) and South Australian (Department of Education and Community Services, 2003). Furthermore, the Australia Council of Deans of Education in the charter for reform (ACDE, 2001) suggested that they should focus on new learning, one aspect of which involved the integration of new technologies in all aspect of learning. Furthermore researchers, academics, and practitioners in early childhood education have also published books, articles, and guidelines which provide information and guidance about ICT in early childhood, and aim to support early childhood education practitioners to make well-informed decisions and choices about ICT (Downes, Arthur, & Beecher, 2001; NAEYC, 1996; O'Hara, 2004; Siraj-Blatchford & Siraj-Blatchford, 2003).

Few empirical studies have investigated how computer technology is integrated into early childhood curricula (Pierce, 1994). In particular, survey studies have been conducted to report the status of computer technology in early childhood education (Bilton, 1996; Haugland, 1997; Wood, Willoughby & Specht, 1998; Love & Sikorski, 2000).

A survey by Bilton (1996) showed that all classrooms had a computer, the children-to-computer ratio was high, only the basic equipment was available, and teachers were trained but often not to a level they would have liked. Wood, Willoughby & Specht

(1998) in their survey found that only basic equipment was available in the classrooms, and early childhood teachers lacked sufficient expertise or experience with computers. Love & Sikorski (2000) who examined how technology was integrated into a Montessori classroom found that all of the eleven teachers who participated in this study agreed that technology fitted well with the Montessori philosophy. However, teachers expressed the following concerns:

1) Children will exit a programme when it becomes too difficult rather than be challenged to the next level;

2) Computers are seen as an escape for children who lack social skills or have language barriers;

3) Children use the computer as entertainment, a toy or wasteful activity;

4) There is insufficient teacher training in order to create the ideal learning experience;

5) Careful monitoring and strict control is necessary for internet use;

6) The computer is seen as a distraction. (p.12)

Additionally, Bucklitner & Hohman (1987) reported that in the early childhood setting, computers were often used as a separate activity in a learning centre in which computers were offered as a choice among other activities. In primary school classrooms, computers have been used mostly for educational games, often used as a reward (Von Blanckensee, 1999).

The research which has been discussed demonstrated that computers have entered into early childhood classrooms, but they have not been fully intergrated into early childhood curricula. These research studies also revealed that early childhood teachers were deficient in adequate computer experience and knowledge. However, it is also important to note that all of the research cited above was completed with teachers or directors who had computers in their classrooms and attempted to use computers in their programme. Further, the sample sizes of these researchers were small and it is unknown whether the research would generalise to all early childhood classrooms. Additionally, through surveys and questionnaires, these researchers only obtained the self reported opinions of participant teachers and directors about how computers were used in the classrooms. The accuracy of these results could be limited compared to observational research.

The issue of the integration of computers into the early year's curriculum continues to be debated among educators. According to Shade and Davis (1997), without appropriate integration, the benefits of computers in fostering children's learning outcomes cannot be fully recognised, regardless of the creative potential of any available software. Some of these concerns include computer locations, using developmentally appropriate software, having the time to work with each child and incorporating the computer into the everyday curriculum (NAEYC, 1996; Wright & Shade, 1994).

Resnick (1998, 2000) suggested that we should view computers in the same way that we view finger paints, blocks, beads, and other materials for making things. He also suggested that compared with "traditional materials" computers can expand the range of things that children can create and in doing so enable them to encounter ideas that were not previously accessible to them. This requires a bold new approach to the curiculum, which encapsulates a notion of design and opportunities for children to explore and investigate in ways that were not possible without new technologies.

As (Siraj-Blatchford & Whitebread, 2003 , p.6) note that :

> The use of ICT in the early years has the potential to enhance educational opportunities for young children. It can be applied in a developmentally appropriate manner to encourage purposeful and exploratory play. It can encourage discussion, creativity, problem solving, risk taking and flexible thinking, and this can all be achieved in a play-centred and responsive environment. However, all of this does demand that practitioners are well trained and skilled in the appropriate uses of ICT with young children (Siraj-Blatchford & Whitebread, 2003, p.6).

The above discussion clearly shows that ICT has a serious implication for children development. Therefore, there is need for a study to explore how ICT is integrated into the pre-school activities especially in a Malaysian context. Further, Malaysian research to investigate the role and use of ICT in Malaysian pre-schools could demonstrate useful practical approaches and also raise any issues specific tothe Malaysian context.

4.3.1 Computers and children's play

O'Hara (2004) describes a range of examples from English ECE settings of ICT featured in chidren's play, including socio-dramatic role play. O'Hara's examples highlight some important themes about high-quality practices in ICT use with young children. These include: children using ICT in "realistic" and imaginative socio-dramatic role-play; children learning to use the correct vocabulary to describe different technologies and activities associated with them (for example, children talking about "typing", "printing", or "looking up flight times" using the computer); and children using different forms of ICT, both indoor and outdoor. O'Hara's examples show that children were being trusted and assisted to be in control of the technologies.

In terms of computer games, the actual or potential learning benefit the computer games have for children is a widely discussed area in the literature (Clement, 2002; Linderoth et al., 2002; Yelland, 2002). Verenika, Harris and Lysaght (2003) speculate that computer games might have a special or unique value for children's play, and that if these are to become a significant part of children's lives, then their developmental value should be examined. In their view:

> "Understanding the range of ways that computer games may or may not contribute to the child's development will enable early childhood educators to make an informed decision when choosing particular software for their setings (Verenika, Harris, & Lysaght, 2003, p.7).

Table 4.3-1: Questions for assessing the contributions of computer games to children's play (adapted from Verenika et al., 2003)

Theories about the purpose or value of play	Relevant questions for practitioners to assess software
General characteristics of play	
Play is a spontaneous, self-initiated, and self regulated activity	Does this computer game allow children to freely engage in play? Does it provide freedom of choice?
Children are actively involved in creating their play and are in control of it	Does this computer game allow children to create their own scenarios, rules, and characters of the play?
Play includes a dimension of pretend	Does this computer game enable children to act in an imaginary "as if" situation?
Classical theories of play	
Play discharge natural energy of the body	Does this computer game allow for discharge of natural energy? If so, in what sense?
Play alleviates boredom while the natural motor functions of the body are restored	Does this computer game engage the interests of the child (with particular children in mind as their criterion is considered)?
Play restores energy that is expended in work	Does this computer game allow for rest and relaxation in an enjoyable and engaging way?
Play affords opportunities to develop skills necessary for functioning as adults	Does this computer game provide opportunities for developing adult skills?
Modern theories of play	
Play reduces anxiety by giving children a sense of control over their world and an acceptable way to express forbidden impulses	Does this computer game enable children to gain a sense of control over events that they could not control in their lives, including traumatic experiences?
Play consolidates learning that has already taken place, while allowing the possibility of new learning in a relaxed atmosphere	Does this computer game have the potential to consolidate existing learning? If so, what kind of learning? Does it have the potential to develop new concepts and skills? Does it engage the child in such approaches as problem solving and self-discovery?
Play promotes the ability to comprehend multiple layers of meaning	Does this computer game operate at literal and figurative levels of meaning? Does it enable children to reflect on the rules and means of communication?
Play promotes sense of self in terms of personal identity and social relations with others	Does this computer game develop a sense of child's own identity? Does it develop a child's sense of his/her own social identities in relation to others? If so, how?
Socio-cultural theories of play	
Play promotes abstract thought by separating meaning from objects and actions and using actions and objects in symbolic ways	Does this computer game involve and develop use of symbolic meaning? If so, in what ways?
Play allows children to reach beyond their actual development in their cognition and self regulation	Does this computer game allow children to engage in their zone of proximal development and function above their everyday abilities in cognitive and socio-emotional areas?
In play, children achieve mental representations of social roles and the rules of society	Does this computer game provide children with an opportunity to act out and explore the roles and rules of functioning in adult society? Does it allow for group work and collaboration?

Verinika et al. (2003) also proposed that early childhood educators could use classic and contemporary theories about the purpose and value of play to evaluate different games and applications. Table 4.3-1 below suggests some questions that teachers and practioners in ECE might use to match against different views and theories about play.

The usefulness of computers in prompting cognitive and social skills is a growing focus of research. Studies by Shaperman, Howard and Kehr (1988, 1993, 1995) with toddler's involved in computer play in a classroom setting found improved communication, task persistence, and social interaction while attention span increased and distractibility decreased. Further research (Howard, Greyrose, Kehr Espinosa, Beckwith, 1996) demonstrated how the intervening adult can not only facilitate but enhance and expand the computer environment to help children move from the abstract screen to "hands-on" curriculum.

Since computers became accessible in current education systems, the link between play and computers remains unclear. Even though the definition of play remains undefinable and the concept is quite vague, the characteristics within the play can be recognised and observed. The following five characteristics of play (Johnson et al., 1999; Almy, Monigham, Scales & Hoorn, 1992; Porter, 1985) were used to examine the relationship to both children's play and their use of computers.

(a) Nonliterality

Within the play frame, children are able to transfer object and situations to 'as if' frames and experiment without worrying about normal consequences. Children are able to perform differently from their everyday experience. Children can flee away from the reality and experiment with new opportunities and possibilities. For instance, children use play dough as ingredients for making pizza which can be baked within 10 seconds and use cups with dark sand to represent hot chocolate.

The computer allows children to have the similar types of experimentation as well. Some researchers have argued that the computer provides children with the ability to engage in various forms of symbolic representation. For example, a child draws a milk carton upside down with the contents spilling and regarded it as the "Milky Way" which is a can pouring milk. Then he draws in circles to represent the meteor in the sky (Escobedo, 1992).

(b) Intrinsic motivation

The motivation of play comes from within an individual who posesses control over the play situation. Although the motivation of play is intangible and unmeasurable, it can be reflected by the way children engaged in an activity, the length of time they spent at it, and the enjoyment derived from the play. Computer use for young children can be intrinsically motivated as well. Many young children choose the computer centre when free play is available. The computer software provides them with opportunities to manipulate the playthings in a risk-free and enjoyable way. If computers cannot meet children's interest and internal needs, children would refuse to access the computer even though it was available. Hence, the computers, along with appropriate software, have potential to hold children's attention and interest.

(c) Process Orientation

Another important quality of play for young children is a means-over-ends orientation. Play allows children to try different variations of the activity and frees them to focus on a particular goal. While playing, children's attention concentrates on the satisfactions and benefits of the activity itself instead of on the goals of the activity. The flexibility of play provides children with opportunity for experimentation and exploration in a risk-free environment. Many computer software programmes do possess the characteristics of allowing children to experiment. For instance, the drawing and painting software allows chidren to create a picture by trying out and combining different kinds of drawing tool and colours. Children are also encouraged to explore the shape, colour and lines with little concern about the product. However, some drill-and-practice and skill-based software programmes which emphasise "getting the right answer" tend to be product-oriented. Even though this kind of software can lead to learning, it doesn't provide a joyful learning environment for children to freely explore and interact with the computer.

(d) Free Choice

Play choice is not as important as play pleasure as children grow older (Johnson et al., 1999). However, the choice and inner control are important features of play during the early childhood years. Computer centres can be arranged as one of the play centres in the early childhood classroom. The teachers should encourage children to choose freely their own play centre; meanwhile, the computer centre should be supplied with a variety of software which children can freely choose according to their interests. In the study of children's play worlds and microcomputers, Wright and Samaras (1986) found that children as young as 3 and 4 years of age could understand the need for care and still experience the freedom necessary to allow the microcomputer to be viewed as a plaything freely chosen and without adult-oriented goals. The adults should provide a setting in which children can extend children's imagination and permissively explore the world.

(e) Positive Affect

Play is always an enjoyable childhood activity which meet children's internal needs and provides pleasure and enjoyment and a channel for their energy. The play material and objects also determine the playfulness of play. Jones and Liu (1996) conducted a study on how pre-kindergarten children use the interactive multimedia technology. They found that children demonstrate a great interest in using the technology and have long attention spans while engaged in the computer activity. The video, sound, and animation effects indeed draw children's attention to the programme and increase their positive attitude towards computers; however, children will lose interest if the software only relies on these special effects without having designs that enable children to use the programme in an open-ended way. A well developed computer software programmes provides childrens with the opportunity to manipulate in a creative and meaningful way and enthrall children's imagination and attention.

The dynamics that exist at the computer encourage and allow children to extend themselves into more sophisticated play behaviours. This is particularly true in terms of the quality of "active waiting". "Active waiting" (Howard, Greyrose, Kehr, Espinosa, Beckwith, 1996), is prominent behaviour among children engaged in computer activities. "Active waiting" is defined as the ability to wait with interest and attention to task while peers are otherwise engaged in taking turns and communicating. The skill of "active waiting" is a basic component of positive social interaction at all stages of development.

Howard, Greyrose, Kehr, Espinosa, Beckwith, (1996) indicate that children who are exposed to computer activities are more able to develop beginning attributes of cooperative play: negotiating, communicating, and engaging in play. This developmentally appropriate behaviour is cultivated by the use of computer programmes which approximate to many of the usual situations encountered in groups of young children such as singing, getting dressed up, or playing with vehicles ("Wheels on the Bus", "Dress Me", "Community Vehicles" developed by the UCLA Intervention Programme). In this same report, children who received computer opportunities showed an increase in simple cooperative play during off-computer activities. While the reasons for this have not been clarified, it appears that there may be an association between the children's achievements at the computer and the ability to transfer these skills into social play situations. These findings warrant further exploration as the significance of computer play in fostering language, literacy, social competence, and emotional mastery of difficult events has been well documented (Goncu, 1993; Howe, Moller, Chambers and Petrakos, 1993; Howe, Unger and Matheson, 1992).

Yet in order to achieve results such as these the stage must be carefully set within the classroom and with all the individuals involved. Preparation of the classroom environment, classroom staff, families, and children are essential to the overall success of computer use within the educational curriculum. In planning for the integration of the computer into the classroom environment it is necessary to consider: the appropriate location for computer activities; the purchase or construction of a cabinet to house the hardware, software, and adaptive devices (design for accessibility, i.e., monitor at eye level); determination of the timing of computer activities; incorporation of computer activities within the development appropriate paradigm and creating ancillary materials to conjoin computer themes to concrete play experiences. In relation to this, therefore there is need for a study to explore how the computer is integrated into the pre-school classroom in the Malaysian context as a computer is a new phenomena in Malaysian pre-school education.

4.4 Factors Contributing to Young Children's Engagement in Computer Activities

In spite of the dramatic improvement in computer technology and research that reveals the benefits of computer technology, it has been reported that the majority of the early childhood teachers have not embraced technology and integrated computers into classrooms (Haugland, 1995; Means &Olson, 1994; Wood, Willoughby & Specht, 1998). Recent studies from countries including Australia (Cooper, Farquhar, & McLean, 2001; Downes et al., 2001), Finland (Kankaanranta & Kangalasso, 2003), the UK (O'Hara, 2004), Scotland (Learning and Teaching Scotland, 2003a), and New Zealand (Bain, 2000) suggest that in many early childhood education settings, ICT use is minimal. Why is computer technology not being used more effectively and integratively with young children? Haugland (1995) discussed four major challenges that were essential for computers to have a significant effect on early childhood education. These challenges included: teacher awareness of the potential benefits of computers; teacher openness to technology; teacher training; availability of computers in the classrooms.

Haugland (2000) also states that, "How computers are used with young children is more important than whether or not computers are used at all" (p.12). It has been suggested that integrating computers into classrooms can make a considerable difference in children's development and learning. On the other hand, misuse of computers may have an adverse effect on children's development and learning or may even reduce children's creativity (Haugland, 1992). Therefore, an effective integration of the computer is essential.

Filipenko & Rolfsen (1999) found the decision for computer use in pre-school classrooms was influenced by four main issues, including those associated with equipment requirements, the need to learn how to use the computer, the need to manage the computer centre in the classroom and the process associated with the selection of appropriate software. Other research tends to support these findings, suggesting that significant factors related to early childhood educational computing include, teacher knowledge regarding the basic operation of a computer, issues associated with the selection of appropriate software for young children, access to up to date technology, and consideration regarding the physical location of a computer within the classroom (Haugland, 1997; O'Rourke & Harrison, 2004).

Furthermore, Clements and Sarama (2002) describe, the central focus with respect to computing in early childhood education is no longer whether or not they should be used:

> We know that computers are increasingly a part of pre-schools' lives. From 80 percent to 90 percent of early childhood educators attending the annual conference of the National Association for the Education of Young Children report using computers. Such use is no surprise; research on young children and technology indicates that we no longer need to ask whether the use of technology is developmentally appropriate (Clements & Sarama, 2002, p. 340).

It is on the basis of this belief that more recent research has begun to shift from an examination of the effects of computer use on young children, to encompass consideration of other issues related to their integration in the early childhood classroom. For example, as Clements (1999) identified:

> Research has moved beyond the simple question of whether computers can help young children learn. They can. What we need to understand is how best to aid learning, what types of learning we should facilitate, and how to serve the needs of diverse populations ... not every use of technology, however, is appropriate or beneficial. The design of the curriculum and social setting are critical (Clements, 1999, p. 93).

Clements' identification of the broader issues associated with early childhood computing is important and suggests that recent research developments in the area, such as the focus on teacher perceptions of computer use in early childhood education, and issues associated with the integration of computers into early childhood classrooms are becoming increasingly important (Brooker, 2003; Plowman & Stephen, 2005). A significant feature of this research has been the emphasis on examining the *context* of computer use rather than a focus on the relationship between computer use and children's consequent development. The shift in focus has served to broaden conceptions of computer use in early childhood education to include reference to early childhood teachers, their beliefs, understandings and confidence regarding not only the integration of the computer within their classrooms, but also their ability to relate the technology to existing pedagogical approaches to early education.

The summary of the literature identified important factors contributing to children's engagement in computer activities and these discussions included: presence of required technology tools, sound understanding of educational philosophy and goals of the classrooms, and availability of computers. Each factor and their subcategories will be discussed in the following section. These factors were found to have varying effects on children's level of engagement at the computer.

4.4.1 Required Technology Tools

Selecting appropriate technology tools such as computer hardware, software, and the Internet, is an important part of the computer use in pre-school classrooms.

4.4.1.1 Hardware

In terms of hardware, the models and capacities of the computers are changing rapidly; thus, these changes challenge teachers and administrators as they select computers for their schools (Haugland, 2000; Shade, 1996). While selecting computers, teachers need to anticipate future needs for the next three years, and to consider the computer's capability of being upgraded (Haugland, 2000; Kalinowski, 2001). In terms of selecting a computer brand, it has been recommended that teachers consider software compatibility and access to maintenance and repair. Additionally, printers, scanners, digital cameras and/or other supporting materials and tools are recommended for early childhood classrooms. In order for computers to be used in a developmentally appropriate manner, young children must have access to updated and functional equipment (Swain & Pearson, 2002).

4.4.1.2 Software

In term of software, there are two types commonly used in early childhood classrooms: open-ended and drill-and-practice. Open-ended software is strongly recommended over the drill and practice software. Several software evaluation systems are available to help educators select appropriate software such as Haugland/ Shade Developmental Software Evaluation, High/Scope Guide, Children's Software Revue, and Computer Services Department and on line Sources of Educational Software Reviews (See Appendix III).

Buckleitner (1999) stated that a look at the past and current methods of software evaluation shows that practices are behind the times, often unreliable, biased by commercial interests, and rarely verified by independent studies. What is needed are more studies such as that done by Escobedo and Evans (1997) where the ratings assigned by the published software methods are compared with actual child selection, or Tammen and Brock (1997), where middle school students are asked to identify issues they feel are important for the evaluation of software programmes. In the Escobedo and Evans study, the results showed some positive relationships between highly rated programmes and children's preferences, although some of the titles identified by the scale as developmentally inappropriate were preferred by children. Additional findings revealed that children preferred the software that provided the opportunity to interact, and interactions were the defining characteristic that motivated selections.

In addition, it is also important to select the software that supports the educational philosophy and goals of the particular classrooms. For early childhood classrooms, the open-ended software, which includes word processors, educational games, simulation, multimedia applications, music and art, is highly recommended (Hohmann, 1990; Von Blanckensee, 1999).

A study by Haugland (1992) found that the effects of the computer depended on the way it is used. Thirty-six pre-school children were divided into three groups using 1) non- developmentally appropriate software; 2) developmentally appropriate software; 3) developmentally appropriate software with supplemental activities. Although children spent more time in activities which involved software alone, they demonstrated more gains in general intelligence, verbal skills, problem solving, long term memory, and self-esteem when supplemental activities were used with the software. The benefits of computer use are dependent on how the software is integrated into the curriculum.

Furthermore, software type was found to play a major role in a study exploring the relation between computers and constructivist thinking for three-year-olds (Brown, 1996). Out of three types of software (workbooks, word processing, and graphics), word processing was found to be most compatible with a child's ability to construct knowledge from their environment, since it allows child control and manipulation of information. A review of other studies on software confirms the value of word processing programmes which allow children to experiment (Clements, Nastasi, & Swarninathan, 1993). In addition well-design software engages children in a process of exploration, maintains children's interest over time, and encourages active participants rather than sitting and watching (Judge, 2001). It should be visually engaging through the use of colourful, uncluttered, realistic graphics and sounds.

4.4.1.3 Keyboard/mouse

The appropriateness of the mouse or keyboard as input methods for young children is often questioned by early childhood educators. In educational software children often have to reposition objects, for instance moving a target to a matching release spot. Roughly two procedures can be used to move objects on a computer screen: drag-and-drop or click-move-click. Drag-and-drop, also referred to as dragging, drag-drop, or point-drag, consists of holding the mouse over an object, pressing the mouse button to select it, repositioning the mouse while keeping the mouse button pressed, and releasing the mouse button after the cursor is positioned at the release-spot (Crook, 1992, Gillan et al., 1990, Inkpen et al., 1996a, Inkpen et al., 1996b, Joiner et al., 1998 and Hohmann, 1990). In the alternative procedure the mouse is clicked to select the object, the mouse is repositioned and the mouse is clicked again to release the object. For children, it has been suggested that click-move-click is more suitable than drag-and-drop (Segers & Verhoeven, 2002).

The ease and efficiency in using an input method may effect children's engagement in computer activities. Not many studies have been conducted comparing the mouse, keyboard, joystick, and the trackball in terms of efficiency of use for young, children (Alloway, 1994; King & Alloway, 1992; Liu, 1996; and Revell & Strommen, 1990). In all of the studies the mouse was found to be the most efficient method of input.

When compared with the joystick and keyboard, the joystick was second in efficiency and the keyboard was third (Alloway, 1994). When the mouse was compared with the joystick and trackball, the joystick was found to be the least efficient, with the mouse and trackball being similar in ease of use and accuracy (Revelle & Strommen, 1990). Similarly, the keyboard as an input method demands more time and attention of pre-schoolers and requires that an abstract connection be made between an object on the monitor and the operation of the arrow keys (Alloway, 1994). No difference was found between boys and girls in their use of the devices, both being equally competent in using the different methods (King & Alloway, 1992).

Joiner et al (1998) conducted two studies which compared children's performance with two basic mouse operations: pointing and dragging. In Study 1 they found that the children who were inexperienced with a computer mouse were quicker and more accurate with pointing compared to dragging. In Study 2 they found that older children were quicker and made fewer errors than younger children regardless of the mouse operation. The results also showed that younger children were slower and made more errors with dragging than with pointing. Young children moved objects faster using click-move-click than drag-and-drop if they had to move objects over distances larger than 200 pixels on a 640 × 480 screen (Joiner et al., 1998).

Donker and Reitsma (2005) found that when using using drag-and-drop and click-move-click, children in Kindergarten 2 clicked and moved slower than children in Grade 1. Nearly all of the children were able to click within 3 mm horizontally and 6 mm vertically from the centre of a 3 mm target. The findings also demonstrate that in educational software drag-and-drop is the most appropriate movement procedure as it was found to be faster than click-move-click and resulted in fewer interaction errors. Interesting differences between horizontal and vertical movements were found. It is concluded that young children are generally well capable of using a mouse to operate educational software, making this a suitable input device for such applications.

4.4.1.4 Internet availability

As a new medium, the Internet offers a variety of learning opportunities that appear to enhance children's problem solving, critical thinking, decision making, language, research skills and the ability to integrate information (Haugland, 2000; Osborne, 1998). On the other hand, these learning opportunities depend on selecting and introducing web sites that are appropriate for children. The Haugland/Gerzog Developmental Scale for Web Sites (1998) is a useful tool for evaluating the appropriateness of websites before exposing children to them. Haugland (2000) classifies appropriate children's web sites into four different categories: information, communication, interaction and publication. An information site includes rich references with which children find solutions to their questions, make discoveries and build knowledge. Communication sites enable children to interact with other children, friends of family members. Particularly, opportunities for children to use e-mail in a classroom setting can help create an environment that emphasises the value of both friendship and written language (Durost & Hutchinson, 1997). Interaction sites allow children to explore programmes online that are similar to software programmes that contain sounds, animation, and graphics. Publication sites allow children to publish their work on the internet (Haugland, 2000). These four types of websites are recommended to early childhood teachers.

Researchers have identified Internet sources to use with children that provide real-time access to topics of interest, access to children's literature and other creative outlets (Skeele & Stefankiewicz, 2002). Although some individuals and groups have called for a moratorium on Internet use in elementary schools (Cordes & Miller, 2000; Light, 2001), most researchers agree that young children benefit from LAN and Internet access.

4.4.2 Educational Philosophies and Goals

Another factor that has an essential role in the computer use in the pre-school is matching educational philosophies and goals of the programme with the computers and software. It has been found that teachers are not likely to integrate a software application into a curriculum unless it is compatible with their instructional goals (Becker, 2000). Educational philosophies and goals are useful guides in conceptualising the role of computer technology in the education of young children (Browman & Beyer, 1994; Downes, Arthur & Beecher, 2000). Various philosophical positions guide the early childhood curriculum, and these philosophical positions shape the ways in which computers get integrated into early childhood education.

One of the positions, developmental appropriateness, is grounded in the developmental theories of Piaget and emphasises that children construct their knowledge through active exploration with material (Bredekamp, 1993). This perspective stresses that computers should place children in control and allow them to work on problem-solving skills. In Developmentally Appropriate Practice (DAP) environments, computers offer active learning experiences for children rather than encouraging them to absorb given information passively.

The National Association for the Education of Young Children (NAEYC) emphasises that appropriate technology is integrated into the curriculum content areas, including emergent literacy, art, music, science, social studies and mathematics (NAEYC, 1996). This integration includes enriching classrooms themes or projects with computer activities, using software as manipulative, and using computers as a scaffold and as an assessment tool (Davis & Shade, 1999; Haugland & Wright, 1997; Hutinger & Johanson, 2000). For example, technology tools such as cameras, word processors and multimedia software make it possible for children to tell their stories using written words, images, sounds and motions. Communication tools such as the Internet, email and video conferencing allow children to communicate their ideas to audiences (Blankensee, 1999). This kind of computer integration involves using computers in meaningful ways in maths, language, science, art and music, as well as in thematic units. When integrating the computers into the curriculum, the primary objective should be to learn ideas about maths, science, language, social studies or some other content area (Muir, 1994).

Another curriculum model that welcomes computers is the Project Approach. This model mainly focuses on providing children with opportunities to get actively involved in their learning by letting them undertake familiar projects (Katz & Chard, 1997). The project approach advocates that computer technology should be incorporatéd into projects, because computers offer new ways to enhance classroom projects. Wright (1998) describes the Computer Discovery Project, which is a series of two-week seminars focused on integrating computers into Project Approach classrooms. In this project, computers are used to increase children's learning opportunities. For example, in a "farm" project, a group of children create families of farm animals in a variety of sizes using a mural marker programme; and they use these puppets to act out life on the farm. Another group of children writes a story about the people who live on the farm. The last group of children publishes a farm book of recipes and songs on the computer (Wright, 1998). Additionally, computers are used to research, communicate and document classroom projects (Trepanier, Hong & Bauer, 2001).

Besides these two positions, other philosophical positions, such as that of Montessori's, Behaviourism, Reggio Emilia and the Bank Street Approach, emphasise different points of view. Therefore, integration of computers varies depending on the programmes' particular emphases. Overall, philosophies and goals of the programmes guide the ways computers are integrated into the classrooms and educators must determine goals and expectation for computer use that are realistic and relative to their curricula (Pierce, 1994)

4.4.3 Availability

The final factor that plays an essential role in the computer use by the children is the availability of computer technology in the classrooms. Home and school use of computers, location of computers in school, equal access among the children and teachers' role in the computer integration process will be discussed under the concept of availability. Research results suggest the impact of technology in classrooms depends on: (a) the quality of the software, (b) the attitude of the teachers, (c) the physical and social arrangement, and (d) the accessibility of the technology (Buckleitner, 1996; Haugland, 1992; Haugland & Shade, 1990; Shade & Watson, 1990; Filipenko & Rolfsen, 1999; Haugland, 1997; Judge, et al., 2004.).

4.4.3.1 Home Use of Computers

Children generally use computers at home and school. O'Neil (1995) reports that children's access is greater at home than at school. Research into young children's use of home computers has been carried out in Australia by Downes (1999). Her purpose was to investigate the diversity of access to home computers, the range of uses, and how patterns of use relate to such factors as gender, age and role models. Children kept diaries; these revealed that the most common home computer activity by both girls and boys was playing games. This took priority over use for writing, drawing, or forms of homework. School-related use is discussed in terms of authoring project presentations and the consultation of reference CD-ROMs. It is not clear how far these children used other educational material (such as electronic books, educational games or drill and practice software). Elsewhere, Downes (1998a) notes the range of local factors that may characterise a child's access to a computer, such as its physical location, who owns it and what rules are made about its use. She also argues that home computers attract a variety of belief systems (1998b) such as home and family practices.

Livingstone and Bovill's (1999) study employs survey and child interview methods to examine computer use both at home and at school for children aged 6–17 years. Their findings showed that most home computer activity (77%) centres on games. This is so even though parents often purchased the computer with educational purposes in mind. The Screen Play Project (e.g. Furlong et al., 2000; Sutherland et al., 2000) investigated the UK children's home computing environment found that, compared to school, the home computer environment was viewed more favourably by their child interviewees. Children perceived more scope for exploration and 'fiddling about', compared to the rigid curriculum restraints guiding what happens in school. Furthermore research by Lucinda & Charles (2002) found that although parents had strong aspirations that household computers should support their child's learning and although parents' main software purchases were educationally oriented, children spent most of their time on games of a sort not typically found in their classrooms.

The number of children with parents who become involved in children's computer activities is steadily growing (Ainsa, Murphy & et al., 1994; Haugland & Wright, 1997). This provides an excellent opportunity for teachers and parents to collaborate on children's learning. This collaboration involves the issues of software selection, computer time, Internet, supervision or other topics. Teachers and parents can help each other and promote children's computer activities (Haugland, 1997).

4.4.3.2 Locations of computers in school

In the mid-1990s, the learning environment studies have moved to include investigations of computer and online classroom learning environments (Chang & Fisher, 2003). In these learning environment studies, computers were perceived as learning technologies that played critical roles in promoting interactions, enjoyment, collaboration, and individualised learning among the learners who came from secondary schools and tertiary institutions. Medvin, Reed, Behr, and Spargo (2003) suggest that the design of the classroom environment can encourage either isolation or integration. They describe a project in their American Head Start pre-school which aimed to make the computer a "social centre" in their classroom. This approach was consistent with the pre-school's socio-cultural approach to learning, which emphasised peer interaction as a means of promoting social and cognitive development. Three rules were introduced to encourage social usage, sharing, and helping behaviour at the computer: the "find a friend" rule says that two or more children must be playing at the computer at all times. "Help a friend" encourages children to stay and help the child with the mouse, play the computer programme by providing directions and information, by pointing, and by physically helping to guide the mouse. "Share the mouse" prompts children to pass the mouse to the friend next to them after they have played for a while.

4.4.3.3 Equal access among children

School play a critical role in ensuring equal opportunity for all children by providing access to computer technology. The National Association for the Education of Young Children's position statement on Technology and Young Children (1996) supports the need for equal access to technology for all children and calls for attention to be paid to eliminating gender stereotypes. A change in attitude is necessary in order to ensure that girls are not deprived of educational and professional opportunities and advancement in the future. Research suggests (Bakon et al., 1983; Marrapodi, 1984) that aggressive affirmative action strategies as well as strong support networks are essential to make girls comfortable and competent in this technological world. The goal is not to make the computer more accessible and attractive to girls than boys, but to ensure that this tool is available to all students in the school (Fisher, 1984). Both girls and boys will benefit from computer opportunities.

Juhlin-Svensson, Sandberg, and Eriksson's (1997) study also revealed that there was no obvious appreciable difference between boys and girls in the use of information technology (IT) in years three - six. From the children's interviews it may be concluded that half of the girls think that boys and girls use the computer equally and frequently. Svensson (1996) emphasised that there were no sex differences regarding interest when it comes to working with the computer, according to pedagogues in her study. Svensson also answered the question about whether boys and girls used the computer in different manners and referred to some pedagogues in her study who demonstrated that girls performed more creative activities at the computer and boys played games.

4.4.3.4 The role of the teacher as children play with computers

The role of teachers includes the functions of the teachers, but it extends and deepens these and adds others. Such extension brings to the role deeper understanding of the processes of development and learning. In the Reggio Emilia approach, the role of the teacher is that of facilitator, resourceful partner, and provocateur of learning. To support the project work, the teacher keenly observes the children's actions and interactions, listens closely to their spoken and unspoken language, and documents their actions, interactions, and language. Together, the children and teacher review the documentation, reflect on their learning, acknowledge their accomplishments, and determine further project explorations. Joint reflection on learning helps both the children and the teacher to analyse successful problem-solving strategies and consolidate and refine their thinking. Through observing, listening, and documenting, the teacher sends the message to the children that they and their ideas are respected and valued. By reflecting on the documentation, the teacher gains new insights into the children's learning process, the effectiveness of teaching methods and strategies that promotes and extends children's development, and the teacher's own professional development.

Furthermore, most learning occurs when an adult is present and is able to interact with the child. "In the most effective (excellent) setting, the importance of staff members extending child-initiated interactions was also clearly identified. In fact, almost half of all the child-initiated episodes which contained intellectual challenge, included interventions from a staff member to extend the child's own thinking" (Siraj-Blatchford et al.2000). Siraj-Blatchford (2000) also reported that teaching and learning were most effective in settings where there were cognitive interactions, including those which lead to sustained shared thinking. Learning was also found to be most effective where there was frequent use of questioning techniques by adults, especially in the context of children's play.

The success of technology in educational settings does not rely totally on having the latest hardware, graphic software, multiple peripherals, and a colour laser printer. All the gizmos and the gadgets in the world operating in tandem cannot work miracles by themselves. "It is people who make technology powerful" (The Alliance for Technology Access, 1996, p.8). It is well recognised that the teacher is central to the successful integration of computer usage into the early childhood classroom (Badget & Snider, 1995; Haugland, 1999, 2000; Kersh, 1999; Liu, 1996; Wright, 1998). According to Chang, (2001) through teacher's scaffolding, children effectively learn with computer technology (Chang, 2001). Additionally it has been found that adult mediation in pre-school computer learning environments facilitates informed use of computer technologies and has positive effects on children's performance (Klein, Gal & Darom, 2000).

White and Manning (1994) investigated the effects of verbal scaffolding instruction on young children's private speech and problem-solving capabilities in public school kindergarten. Bennett (2000) researched teachers' use of children's literature, mathematical manipulation and scaffolding to improve pre-school mathematics. Results of these studies show that scaffolding enhances learning across these areas. However, no recent studies involving teacher scaffolding of technology at the pre-school level have been conducted. Therefore, the present study also focuses on teacher scaffolding of pre-school children's interactions within a technological environment.

Bredekamp and Copple (1997) urged teachers to observe children at work for the following reasons:

> "Teachers observe and interact with individuals and small groups in all contexts (including teacher-planned and child-chosen learning experiences) to maximize their knowledge of what children can do and what each child is capable of doing with and without coaching, scaffolding, or other supportive assistance. To help children acquire new skills or understandings, teachers select from a range of strategies, such as asking questions, offering cues or suggestions, demonstrating a skill, adding more complex materials or ideas to a situation, or providing an opportunity for collaborating with peers. (p. 128)"

The position statement of the National Association for the Education of Young Children (NAEYC) regarding Technology and Young Children-Ages Three through Eight stresses that "the teacher is required to determine if a specific use of technology is age appropriate, individually appropriate, and culturally appropriate" (NAEYC, 1996).

Knowing about children, the teacher provided scaffolding without intentionally interrupting children's concentration and did so in an opportune manner. The teacher's intervention served the purpose of promoting a child's learning before problems and a high level of frustration defeated the learner. "Intervene when children appear frustrated or nothing seems to be happening" (Haugland, 1999, p. 28). The step-in should avoid disruption and intrusion while the facilitation and scaffolding are appropriate (Chang, 1996; Filippini, 1993).

Haugland (1997, 2000) stressed that learning with the computer was markedly influenced by software selection. Shade (1996) stated that the teacher was held responsible for selecting software and determining if computers were to be used as add-ons or integrated into the curriculum. Both Haugland and Shade made it clear that selecting software for the use of young children was the primary and critical decision that the teacher had to make. The National Association for the Education of Young Children (NAEYC) position statement also encourages teachers to pay attention to the children's computer play in order to eliminate "stereotyping of any group and eliminating exposure to violence" (NAEYC, 1996, p. 14). In addition, leaving children completely alone at the computer is considered developmentally inappropriate and may result in absence of benefits that computers could provide for children (Chang, 2001).

Clement (1997) summarised that adults can do the following three steps to facilitate computer play: establishing proper physical arrangement, giving assistance, and selecting software programmes:

First, proper physical arrangement of computers is necessary to ensure a healthy and sociable learning environment. One of the major concerns of computer play is the influence on children's vision. Using TFT-LCD monitors may reduce radiation. In addition, appropriate height of desk and chairs are necessary. Teachers also need to increase the level of teacher direction and decrease the computer-child ratio to minimise behaviours such as aggression and competition (Clements, 1997). Placing two seats in front of the computer and the other seat at the side for an adult can encourage positive social interaction. Having more than three children in the computer centre at the same time can cause crowding and competition among children.

Second, giving "just enough" assistance facilitates computer play. As discussed earlier, the adult's role is important to help children to engage in activities within the zone of proximal development. The adult's role at the computer does not differ from the role in typical play. Being an onlooker, stage manager, co-player, and play leader can all facilitate children's play depending on the situation and setting (Johnson, Christie, & Yawkey, 1999). Flexibility of roles is necessary to fit children's ongoing play. Besides those roles of onlooker, stage manner, co-player, and play leader, demonstrator may be an important role in computer play. Initially the adult's demonstration may encourage children to get a big picture of the software. It is a good opportunity for young children to construct a framework of what they can do with the computer.

Third, selecting software programmes is crucial because it has direct influences on what will happen in the computer activity. Clements and Nastasi (1993) claimed that drill-and practice software has not been as effective as discovery-based software in improving the conceptual capabilities of children. Adults are responsible for selecting proper software to use at home or in the classroom. However, it is almost impossible to identify appropriate software quickly. Haugland and Wright (1997) identified ten criteria for software evaluation. They are: age appropriate; child control; clear instructions; expanding complexity; independence; non-violence; process orientation;

real world model; technical features; and transformations. These criteria may be helpful for selecting software programmes. Meanwhile, research suggests that the children work best if they are given open-ended projects which are goal oriented instead of being asked to "free explore". However, observing the real situation of children's play with the software is important as well. Observation helps adults to understand whether children are challenged by the software, playing within the zone of proximal development, and playing socially.

Teachers have a critical role in making decisions and supporting children in their use of technology. Teachers are responsible for choosing appropriate hardware, software and websites as well as facilitating integrated computer environments for children (NAEYC, 1996). Teacher's positive attitudes, familiarity, confidence and skills with computers significantly affect the quality and quantity of technology used in their classrooms (Pierce, 1994). Hall and Higgins (2002) point out that belief and attitudes about ICT had a direct effect on the way computers were used in the Early Years setting. According to Hall and Higgins, a negative attitude would ultimately result in many children having an unenthusiastic view of technology.

Nir-Gal & Klein (2004) examined the effect of different kinds of adult mediation on the cognitive performance of young children aged 5-6 who used computers. Their findings indicate that children who engaged in adult-mediated computer activity improved the level of their cognitive performance on measures of abstract thinking, planning ability, vocabulary, and visual-motor coordination, as well as on measures of response style, including reflectivity. Based on their findings, it may be concluded that integrating teacher mediation within computer learning environments for young children facilitates informed use of computer technologies in their learning system, and enhances thinking processes and work habits.

Therefore, the present study also focuses on intervention of pre-school children's interactions within a technological environment. This is a particularly worthy area of study as many researchers and theorists contend that it is always preferable to have an adult at the computer with the children to provide all the important guidance and support essential to effective learning.

As mentioned above, teacher's dedication and attitudes towards computers played an important role in the computer integration process. Some early childhood teachers might feel discomfort as a result of their own lack of skills in using computers (Morgan & Shade, 1994). Teachers' philosophical resistance to using computers can be an important issue for not integrating computers into their classrooms. Therefore, in order to make computer integration successful, teachers need to believe that when used appropriately computers are a valuable resource, enriching children's growth and development (Haugland, 2000; Hohmann, 1994). It is critically important that teachers carefully evaluate the role computers will play in children's lives (Haugland & Wright, 1997). The role of computers in classrooms is determined by teachers (Bredekamp & Rosegrant, 1994). Besides that, the computer integration process creates special burdens for teachers (Hohmann, 1990).

Moreover, teachers' strategies have a tremendous influence on the integration process (Chang, 2001). Particularly, it has been recommended that teachers create a computer centre that allows children to work in pairs or in a small groups and encourages cooperative learning. Additionally, providing an initial training period during which an individual or a small group of children is able to explore programmes or software is considered very beneficial. Furthermore, providing scaffolding facilitates the informed use of computers (Klein, Gal & Darom, 2000). Lastly, establishing social rules with children, such as turn taking and collaboration is recommended as an effective teaching strategy (Haugland & Wright, 1997; Hohmann, 1990).

It has been repeatedly suggested that effective integration of computers in teaching environments depends on the teachers' ability to alter the traditional role of teacher-as-knowledge-provider to teacher-as-organiser, diagnostician and guide, learning partner, helper, and mediator of computer-assisted learning at all ages, including early childhood (Clements et al, 1993; Nir; Offir; Salomon, 1996 and Samaras, 1996). Unfortunately, the teachers' roles in a computer learning environment have not been the focus of extensive educational research as yet. The roles of the adults in pre-school computer learning environments were generally overlooked. Therefore, the present study also investigates what kind of interactions take place between teachers and children during their play with computers.

It is essential that the early childhood teacher creates an environment in which technology can be meaningful in the early childhood classroom. "Computers must be viewed as learning environments with multiple capabilities to support and enhance student learning as an important medium for instruction" (Anderson et al., p. 25). It is recommended that early childhood educators use material that "support positive, cooperative interaction, opportunities to engage in social interaction, and adult guidance to prevent problems and support for cooperatively resolving problems that occur" (Bronson, 1995, p.101). The same guidelines should apply to technology within the early childhood curriculum.

Shade (1996) upheld the role of the teacher in ensuring "that the potential benefits of technology for young children are realised" (p. 17). According to Sheridan & Pramling-Samuelason (2003), much research considers that children's ICT learning is significantly affected by teachers' pedagogical awareness, education, and ability to meet each child's interest and support, stimulate, and challenge their learning, through ICT, in the direction of their overall goal. However, studies suggest that many practitioners lack awareness of the general issues around young children's ICT use (Bain, 2000), or do not see how ICT can be included in a curriculum focusing on play and creativity (Downes et al., 2001).

Stephen and Plowman (2003) describe that the use of ICT in early childhood centres in this country as "a work in progress". Their research found that computer use was often limited to children's "free play" activities and many teachers were confident in the mechanics of ICT use, but most felt that they did not have enough experience to feel confident about integrating ICT into teaching and learning activities. Although they were enthusiastic about the values of ICT in their centre, there was overall a lack of developed pedagogy for integrating the computer into wider learning activities.

Furthermore studies from countries including Australia (Cooper, Farquhar, & McLean, 2001; Downes et al., 2001), Finland (Kankaanranta & Kangalasso, 2003), the UK (O'Hara, 2004), Scotland (Learning and Teaching Scotland, 2003) and New Zealand (Bain, 2000) suggest that in many early childhood educations settings, ICT use is minimal, and ECE teachers are uncertain about the value of ICT, or how it could contribute to their practice. O'Hara (2004) explained that the lack of technology use in ECE could include: teacher's limited training opportunities in the use of ICT; insufficient equipment or funds to buy equipment; absence of on-site technical support; or lack of time to develop ICT integrated teaching or learning activities.

Sheridan and Pramling-Samuelson (2003) consider putting ICT use and teacher involvement in an early childhood setting into three levels of quality: "Low quality"; "Good Quality"; High Quality". Table 4.4-1 shows the three level quality of ICT use in an early childhood education setting.

At a low level of quality (isolation), children's ICT use is self-contained and disconnected from other learning activities. The computer may be situated in a corner away from other play areas. Children seldom use the technology and teachers do not encourage its use. Teachers do not actively scaffold children's learning while they are using ICT, other than to ensure children take turns, and have basic skills to use ICT. At a good level of quality (integration), the computers are relocated into a more central position among other classroom activities. Computers and other ICT equipment, such as digital cameras, are available for children to use. Sitting together in front of a computer, children communicate, discuss strategies, solve problems, and have fun together while they use games and educational programmes.

Table 4.4-1: Levels of quality of ICT use in an early childhood education setting (Adapted from Brooker, 2003 and Sheridan and Pramling-Samuelson, 2003)

	What this might look like in an early childhood education setting.		
	Physical and technical arrangements	Role of children and adults	Scaffolding of children's learning
A low level of Quality ("isolation")	Only one computer is available for children to use, at the teacher's discretion Only a few software programmes are available, the software is unconnected with the current classroom themes and topics. The child operating the computer has his or her back to	Children seldom use the computer, nor do teachers encourage its use. Teachers often take a controlling and instructing role, partly to ensure that all children have equal opportunities to use the computer.	Teachers stop engaging themselves once children are self-sufficient and have learned basic ICT skills.

	the other children and is not involved in their activities.		
A good level of quality ("integration")	The computer is relocated into a more central position among other classroom activities. Computers and other ICT equipment (such as digital cameras) are available for children to use. A range of software programmes is available, including pedagogical programmes, creativity/multimedia programmes, and games.	Sitting together in front of a computer, children help each other, negotiate turn-taking, and tutor each other. Children communicate, discuss strategies, solve problems, and have fun together while they use games and educational programmes. Children develop different strategies while learning to handle the computer and/or different programmes. They ask friends, experiment, guess, move the mouse aimlessly, use help functions, and explore by themselves or with friends. Teachers encourage children to send email, use the internet for information, and write or illustrate, or lay down soundtracks and narration for their own stories on the computer.	The computer is still not an integrated part of other activities in the pre-school. Its uses can be described as learning by doing various activities on the computer, compared to learning through the computer.
A high level of quality ("immersion")	Children use computers and ICT equipment throughout the days as a multifunctional tool that is integrated with other activities and themes. Children learn through the computer and from each other while using a variety of programmes or creating their own.	Children explore new topics, are creative in their search for information, ask questions, and express their reflections and feeling. Practitioners and children use computers to document children's activities, make labels and signs as needed, and send messages. Parents can access information while in the setting.	Teachers interact with and guide the children. They create possibilities in which ICT can be used to support children in developing new experiences and to expand their world.

Although teachers encourage and support children's use of ICT, the technology is still not an integrated part of other activities in the pre-school. At a high level of quality (immersion), children use computers and ICT equipment throughout the day as a multifunctional tool that is integrated with other activities and themes. Practitioners and children use computers to document children's activities, make labels and signs as needed, and send messages, and parents can access information about their children's learning or activities or about early childhood education in general, while in the setting. The most important goal for the teacher is to help children experience the technology as a communication information tool with vast possibilities, and to give the motivation to explore and create to the edge of their and the technology's limits, thereby helping the children to become good communicators, information seekers, and evaluators of content.

Van Scoter and Boss (2002) point out that computer and others technologies add to, rather than replace, teachers' complement of tools and activities:

> "New technologies offer teachers additional resources to use as they plan to meet a range levels, learning style, and the individual needs of students" (Van Scoter and Boss (2002, p. 10)

In conclusion, effectively integrating computer technology into the curriculum demands effort, time, commitment and sometimes even a change in one's belief. Research also provides strong evidence that certain computer environments, such as factors contributing to children's engagement in computer activities, hold the potential for the computer's facilitation of these educational goals. Finally, there is equally strong evidence that the curriculum in which computer programmes are embedded and the teacher who chooses, uses, and infuses these programmes, are essential elements in realising the potential of technology. Therefore, the study also aimed to examine and describe pre-school teachers' views and conceptions of the use of computers in the pre-school classroom and how do teachers adapt the curriculum to incorporate the use of the computer into pre-school activities.

4.5 Research Related to Young Children's Computer use

Interest in what computers might have to offer learning goes back at least 30 years (e.g Suppers, 1966) but the widespread availability of the microcomputer in the 1980s provoked new interest amongst psychologists and educators in the issue of computers for learning. Computers become not only the thing to learn about, they were the things to learn with. Predictions were made to the effect that by the turn of the century computers would provided major means of learning at all age levels and in all subject areas (Bork, 1980). The introduction of microcomputers presented educators with a new, potentially powerful instructional tool.

However, microcomputers were not connected to the school curriculum until the early 1980s due to high expense and lack of research done on their impact to student's diverse developmental outcomes. In the early 1980s and even 1990s, computers in the early childhood environment were not universally accepted. There has been a great debate regarding the potential costs and benefits of computers on young children. Some opponents believed that computers should not be placed in the early childhood classroom (Elkind, 1987; Cuffaro, 1984). They were worried that computers would replaced hands-on activities, isolate children's social interaction, and provide unreal images of the world; meanwhile, they questioned if computers indeed did improve the quality of instruction in schools. Many studies have been conducted on the relationship between young children's development and the microcomputer to examine the above concern. Proponents believed that as long as the computer was used in a developmentally appropriate way, young children would benefit tremendously from computer technology (NAECY, 1996; Shade, 1991; Davis & Shade, 1994).

There has been some concern about intergrating computers into the early childhood classroom. Too often, computers have been placed into early childhood classrooms without any integration plans on how to use computers in the curriculum or the day to day activities in the classroom. Shade & Davis (1997) point out that how teachers implement computers in the early childhood classroom curriculum is important. This could have a negative impact either on the young child's ability to learn through the use of the computer or on many other aspects of the child's development, as based on best psychological and learning priciples.

The National Association for Education of Young Children (NAEYC) (1996) the leading association and accreditation organisation in the early childhood field, strongly suggest that technology should be integrated into early childhood practice physically, functionally, and philosophically. They recommend that technology should be integrated into the daily routine of classroom activities. For example, a teacher might introduce musical rhythm with actions, recordings, and a computer used as an electronic rhythm-machine game. Another recommendation, which has been offered by NAEYC, is related to the location of computers in the classroom. As a part of integration, computers should be inside the classroom rather than in a separate computer lab. Additionally, NAEYC (1996) suggests that technology can be integrated across subject-matter areas such as in the dramatic play area for preparing signs, and in the math centre for recognising shapes.

Furthermore the position statement of the NAEYC on Technology and Young Children-Ages Three through Eight (1996) is an authoritative and broad set of principles for the use of technology in early childhood education. It has directly informed guidelines and evaluations for programmes, curriculum, and software. NAEYC advocates that:

1. Professional judgment by the teacher is required to determine if a specific use of technology is age appropriate, individually appropriate, and culturally appropriate.
2. Used appropriately, technology can enhance children's cognitive and social abilities.
3. Appropriate technology is integrated into the regular learning environment and used as one of many options to support children's learning.
4. Early childhood educators should promote equitable access to technology for all children and their families. Children with special needs should have increased access when this is helpful.
5. The power of technology to influence children's learning and development requires that attention be paid to eliminating stereotype of any group and eliminating exposure to violence, especially as a problem strategy.
6. Teachers in collaboration with parents should advocate for more appropriate technology applications of all children.
7. The appropriate use of technology has many implications for early childhood professional development (NAEYC, 1996).

The ultimate goal of technology in the classroom is to foster children's learning. According to Inkpen (1997), when discovering a new technology, children need to experience enjoyment from their computer interactions in order to continue investigating the possibilities of that technology. Research has shown that children enjoy working on technology that supports cooperative activities. Stewart et al. (1998) report that collaborative technology can foster social interactions, such as increasing assistance between collaborative partners, which have been shown to provide positive academic and social benefits. The educational potential of computers in learning and instruction, and their impact on the social and affective aspects of classroom functioning has been widely reported and debated in recent research reviews (Light, 1997). Weiss et al. (2006) investigated the effect of multimedia environments on pre-school children's mathematical achievement and learning with computers. One group was exposed to multimedia embedded in cooperative learning (CL), the second group was exposed to multimedia embedded in individual learning (IL) and the control group (C) was not exposed to multimedia. Their findings indicated that the CL and IL students significantly outperformed the control group in mathematical achievement. The IL students further improved their mathematical skills at the higher level, while the CL students further increased their positive attitude about cooperative learning.

In terms of practice it is well documented that group work with computers is a continuing economic necessity in primary education and that teachers tend to prefer this compared to individual work (Wegrif & Scrimshaw, 1997). The extra activities involved when participants build and maintain a shared understanding of the problem suggest that collaborative learning is not a single process or learning mechanism. As Underwood and Underwood (1999) indicate, this distinction between collaborative and co-operative working is an important one to make. They found that pairs of children who talked constructively together, introducing knowledge and suggesting ideas as well as accepting information from each other, performed better than those who did not use the computer.

Early childhood educators who are interested in using computers face a dilemma. Are computers good for children's development and learning? The increasing pervasiveness of ICT has led some parents, teachers, and children's advocates to question its relationship to the cognitive, emotional, social, and developmental needs of young children (Stephen & Plowman, 2003, p. 4). Various studies in this area have been conducted to assess the benefits and risks of computers for young children. Stephen and Plowman (2002) suggest there is a proliferation of literature which makes claims for both the benefits, and potential risks, of young children's use of ICT (mainly in terms of computers). However, Stephen and Plowman consider that "the evidence base for much of this writing is weak" and say that much of this literature relies on assertion rather than empirical study, or recycles a limited number of older studies.

Longitudinal studies, such as Apple Classroom of Tomorrow (ACOT), demonstrate that the introduction of technology into classrooms can significantly increase the potential for learning, especially when it is used to support collaboration, information access and the expression and representation of students' thoughts and ideas (Sandholtz, Ringstaff & Dwyer, 1997). On the other hand, the Alliance for Childhood (2000) reports the potential harm of computers to young children. These controversial views will be discussed. This discussion is organised in term of research on young children's developmental areas: social-emotional, cognitive, physical and language. Luke (1999) argues that:

> "children's cognitive, behavioural, and emotional development can no longer be assumed to fit unproblematically into traditional lock-step developmental stages. Today, children's early literacy and play experiences are shaped increasingly by electronic media" (Luke, 1999,p.97)

4.5.1 Social Emotional Development

Clement and Sarama (2003), in their summary of the research about technology for young children, discuss the value of computers in five areas: social and emotional development, cognitive development and learning, creativity, language and reading, and mathematics. In the social and emotional domain, they maintain that research and practice indicate that:

> Computers can serve as a catalyst for positive social interaction and emotional growth......Computers can facilitate both social and cognitive interaction-each to the benefit of the other. Good software encourages children to talk about their work as well as engage in more

> advanced cognitive types of play than they do in other centres. (P.34-35)

Several researchers (Benford et al., 2000; Inkpen et al., 1995; Stewart et al., 1998 and Stanton et al., 2001) show that children enjoy and benefit from collaboration with other children when using computers. As Inkpen et al. (1995) suggest, "Children naturally gather in groups, especially to play games". Collaborative computer technologies are a thriving new field in children's computer use and focus on teaching new social skills to children. Medvin et al. (2003) reported that although children initially needed help to follow the rules, they seemed to enjoy working at the computer together, and gradually needed less guidance from an adult. The computer became a "peer-led centre":

> Children spontaneously offered assistance to their friends in changing the game and exploring the programmes. The children helped each other play new games as well. Some students had the same games at home and were able to assist their peers. At other times they simply problem solved until they found the solution (Medvin et al., 2003, p. 16).

Besides that, research has demonstrated that children prefer working with partners to working alone while engaged with computers, they often choose to work in pairs or in a small groups (Clements & Nastasi, 1993; Dwyer; Fitzpatrick & Hardman, 2000; Svenson, 2000), and they initiate interactions more frequently and in different ways than when engaged with traditional activities (NAEYC, 1996). McCormick (1997) also reported that children have extensive social interactions with their peers while playing with computers. Even when working alone, young children consult their peers. They spontaneously teach and collaborate with each other in computer environments (Svenson, 2000). Research by Inkpen, (1999) and Johnson & Johnson (1999) showed that children enjoy playing together and are very good at engaging in fruitful face-to-face social interactions in a Collaborative Learning (CL) environment and lead to significant academic and social benefits. Also, research in psychology and education by Stanton et al (2000) has demonstrated that children working in pairs, or small groups, and interacting with computers can have advantageous effects on learning and development, especially in young children.

In addition to fostering children's social interaction, computers can give children an increased sense of power over their environment. As a result, children may develop greater self confidence and self-esteem. Computer activities also enhanced self-knowledge and expression (Jones & Selby, 1997; Haugland, 1996). Furthermore, computer activities foster positive attitudes toward learning and enhance children's motivation (Clements & Nastasi, 1993). Research suggests that young children enjoy working with computers and display enthusiasm and positive attitudes toward learning (Shade, 1994; Wright & Samaras, 1986). Several researchers also report that teamwork, cooperation and cross-age helping occur in computer environments (Genishi, 1988; Svenson, 2000; Wild, 1996; Wright & Samaras, 1986). Computers can effectively encourage supportive scaffolding interactions among children (Freeman & Somerindyke, 2000).

Mohamad & Dawn (2001) investigated the collaborative interaction patterns exhibited by 5-year-old pre-primary children while playing with peers with computers within a naturalistic classroom environment. They found that the factors that facilitate and inhibit collaborative interaction were identified as: developmental appropriateness of the software; pre-existing computer competency and attitude towards the computer; mutual friendship between collaborators; children's social goals; appropriate structure of enjoyable learning environment; mutual understanding of the turn-taking system; and nonisolated physical settings. Their result showed that early childhood educators would be in a better position to integrate the computer into their classroom and to promote positive prosocial interaction among children whilst engaged with the computer, if it were to be afforded the same status as other traditional early childhood learning materials and activities.

Padmore (1991) investigated children's social interaction and examined the children's perception of introducing microcomputers into young children's learning environments. In addition, the social interactions of randomly selected children were observed pre-and post computer. The findings showed that the majority of young children in this study perceived computers as fun both before and after using them. After they had hands-on experience in the school or kindergarten setting, only a very small minority of the children described computers as "no fun at all." These findings lend support to the view that, for many, but not all young children, computers are intrinsically motivating in the sense of providing pleasurable or enjoyable learning activities. Among the sub sample of observed children, the 42 observed children in this study did not appear to become socially isolated when a microcomputer was introduced to kindergarten and junior class settings. Overall, the results tend to support Hill's (1985) revised view that working with computers can have a positive influence on young children's socialisation.

Muller and Perlmutter (1985) observed the pre-school children's interactions while working on problem-solving tasks on learning games at a computer. In study I, the children sharing, verbal and non-verbal instruction, and initiation of interaction were recorded. They found that sixty-three percent of the children's time at the computer was spent with a peer, and they often spontaneously shared and instructed each other. The results showed that the children's age related to increases in time spent at the computer, as well as self-initiation of interaction and sharing. No differences were found between boys' and girls' activities at the computer. In Study II, children were observed while working with jigsaw puzzles. In this context, children worked with peers just 7% of the time, and exhibited far fewer instances of cooperative interaction. The results of the research indicate that pre-school children can engage in cooperative social interaction and instruction, and that under certain circumstances this activity may aid problem-solving. The research provides evidence that even children younger than school age can work effectively at computers. Moreover, the findings contradict common stereotypes about gender differences and social isolation from effects of computers.

Eunsook (2005) explored the characteristics of 5 to 6 year-old kindergartners' peer dynamics during a seven week learning experience in a computer-based technology-rich classroom in the US. The findings showed that the children exhibited a gain of 38.5% on their ICPC scores. Paired children who differed in computer proficiencies but shared similar interests worked very well, exemplifying Vygotsky's dialectical constructivist perspective on peer teaching and learning characteristics. Their conversations displayed self-confidence, multiple perspective-taking skills, and reflective self-assessment. The pairs who demonstrated limited computer proficiency frequently engaged in serial turn taking and non purposeful clicking on the computer screen. This study concluded with pedagogical implications for teachers where computers may well become a powerful learning tool and resource with which teachers may support collaborative learning in the classroom. This study also inspire teachers to practice the thoughtful pairing of students in a technology-rich classroom where collaborative learning can flourish.

A study by Pange and Kontozisis (2001) of Greek pre-school children and the collaborative use of computers found that they offered quite a lot when it came to learning new concepts and gaining new knowledge. They based their work on Vygotsky's socio-cultural theory of learning where children's communication with their teachers and their peers is paramount. One of the major outcomes of this study was the 'collaborative patterns that children developed while working with the computer'. More experienced children helped those with little or no experience. As Ager (1998, p18) puts it:

> Collaborative work between two or three children in front of a computer working on any type of problem solving activity can create an environment in which children within the group can provide scaffolding that they each need in order to progress.

According to Pavri (2001), when children collaborate with friends, information is transmitted from one person to another, which fosters mastery of specific tasks. Such interactions provide opportunities for conflict resolution, which enables children to develop social skills.

4.5.2 Cognitive Development

The majority of research studies report positive findings with regard to the effects of computers on children's cognitive development. Research in this area focuses on acquisition of specific skills, such as mathematical and language skills, as well as creative thinking, problem solving, decision making and higher order thinking abilities. Educators and researchers believe that children at the pre-operational stages of thinking need many opportunities to construct their own knowledge through hand-on activities, such as manipulation of three-dimensioned, sensory stimulating objects (Brown, 1996). Unlike the traditional play material such as blocks and sand, computers seem abstract because everything constructed is merely on the monitor or a printout. However, engaging in computer play does require a reconstruction of cognitive structures because appropriately designed software require children to think hard to solve a problem or a programme task.

Research has provided strong evidence that certain computer environments, such as LOGO, word processing and design tools, hold potential for the computer's facilitation of creativity (Clements, 1996; Howland, et al., 1997). Haugland (1992), for example, investigated the effect of developmental software and non-developmental software on children's intelligence, creativity and self-esteem. During a 7 month time span with 9-software treatments, she found that children exposed to non-developmental software had significant losses in creativity; whereas children exposed to developmental software had significant gains in intelligence, non-verbal skills, structural knowledge, long-term memory, and complex manual dexterity.

Fleccher-Flinn & Suddendorf (1996) found that having frequent encounters with computers fosters the development of representational thinking and meta-cognition in three to five years-old. Software with substantial scaffolding features increases children's general cognitive abilities (Shute & Miksad, 1997). Furthermore, Elias, Railsback, and Van Scoter (2001) emphasised that technology can increase cognitive development when it is combined with language use and social interaction.

Li & Atkin (2004) explore the association between early computer experience (both accessibility and frequency of use) and cognitive and psychomotor development among young children in a rural county Head Start programme in the United States. Their findings showed that children who had access to a computer performed better on measures of school readiness and cognitive development, controlling for children's developmental stage and family socioeconomic status. However, the data in the study did not suggest a relationship between computer experience and visual motor or gross motor skills among the participating children.

In her review of research on technology in early childhood education, Haugland (2000) believed the following:

> The potential gains for kindergarten and primary children are tremendous, including improved motor skills, enhanced mathematical

> thinking, increased creativity, higher scores on tests of critical thinking and problem solving ... and increased scores on standardized language assessments. In addition, computer use enhances children's self-concept, and children demonstrate increasing levels of spoken communication and cooperation. Children share leadership roles more frequently and develop positive attitudes toward learning.

Clements (2002) reviews research on young children's mathematical learning in conjunction with various forms of computer-mediated practice including the use of drill-and-practice mathematical software, and the exploration of shapes, patterns, and numerical relationships using general-purpose graphics programmes, or specialised "computer manipulative" programmes in which children are able to perform specific mathematical transformations on objects on the screen. Clements (2002) concludes there is evidence that computers can assist even very young children to develop mathematical ideas, provided teachers are able to choose and use these tools in a way that scaffolds and extends young children's thinking, in particular, their higher-order thinking:

> Unique advantages of computers for fostering higher-order thinking include: allowing children to create, change, save, and retrieve ideas; promoting reflection and engagement; connecting ideas from different areas, such as the mathematical and the artistic; providing situations with clear-cut variable means-end structure, some constraints, and feedback that students can interpret on their own; and so allowing children to interact, think, and play with ideas in significant ways (Clements, 2002, p. 167).

4.5.3 Language Development

Research in this area of development focuses on both oral and written language development in children. Kelly & Schorger (2000) point out that the use of computers as a self selected activity in early childhood classrooms can be as enriching for children's language development as other traditional learning centres. Kumpulainen (1994) investigated the nature of children's talk during the process of collaborative writing with a computer. Children's talk was found to be highly task-related and to concern mostly composing, not ways on how to use the computer.

Language development and emerging literacy is the curricular area that is most frequently studied in relation to ICT in the early years (Matthew, 1997; Moxeley et al., 1997; Shilling, 1997; Mioiduser et al., 2000; Nicholson et al. 2000; Van Daal & Reitsma, 2000, Kelly & Schorger 2001, Pav & Clare 2003). Research in this area of development focuses on both oral and written language development in children. Lewin (2000), for example, explored the effects of talking books software in UK primary schools (focusing on 5 and 6 year old children) and found that electronic books can complement teaching in infant classrooms, having a positive effect on cognitive and affective outcomes.

De Jong & Bus (2002) point out that it has often been argued that the computer can be used to supplement reading to children but not replace the teacher. In recent years, the computer has become very common in schools and 'living books' have become available. Living books are presented on the computer and include such features as animations or karaoke text. Living books allow children to interact with the story (Underwood & Underwood, 1998); they are very motivating; and they combine both audio and visual elements.

4.5.4 Supporting children with special learning needs

Assistive technology is a common and accepted way of improving the independence and function of people with disabilities. According to Brett (1995):

> Children with disabilities often suffer from learned helplessness because they cannot use traditional methods to affect their environment. They learn that activating a switch or touching a key produces an effect. They begin to gain control over their environment, and their feelings of helplessness are replaced by a sense of competence and empowerment. (p. 9).

Labbo et al. (2000) describe strategies they used with computers in their kindergarten to assist children who were experiencing literacy difficulties. Five-year-old Joey struggled with many aspects of literacy, although he could decode words and read simple text. When using the kindergarten computer, Joey was observed to "window shop", clicking silently from screen to screen. Joey's teachers decided to try engaging him in highly focused activities on the computer using a "talking book". The interactive features of the book allowed Joey to predict which words on the screen might rhyme, and then to check his prediction by clicking the mouse. Labbo's field notes from observations of Joey and his teacher working on the computer illustrate how this approach helped Joey (see box 1).

> Joey goes to click several times on the words *me* and *we* on the page. It's as if he's reaffirming and concentrating on how those words have the same ending sound. Joey clicks on the words *me, we,* and then he pauses with the cursor arrow over the word *the*..." wonder, does t-h-e- rhyme with me and we?" he asks.
> "It depends on how you say it", Ms Sprague responds. "Try it out and see."
> He clicks on *the* and sighs when it is pronounced "tha". What is interesting is his recognition that the final *e* in a one-syllable word should have a long *e* sound. His interaction provided him with a moment of clarification. (Observational field notes, Labbo et al., 2000, p. 7)

A recent study by Shimizu & Yamamoto (2000) reported that children who had severe to moderate mental retardation could use a mouse. In conclusion, computer technology seems capable of providing children with special needs alternative paths of development. Both physically and emotionally; and technology sometimes can furnish the child with something he or she is lacking physically or provide a tool to overcome a natural or learned impediment.

4.5.5 Negative Effects of children's Computer Use

The controversy surrounding the appropriateness of computer use with young children has been ongoing for almost two decades. One of the key arguments has been that young children do not have the fine motor, cognitive, or language and literacy development, to successfully engage in computer experiences. Another is that computers are a symbolic media which do not enable children to manipulate concrete objects and are therefore not developmentally appropriate. At its extremes, the debate has become polarised between those who consider computers to be detrimental to health and learning and those for whom computers can make a key contribution to children's social and intellectual development.

Wartella & Jennings (2000) indicates that computer use can contribute to a child's self perception and affect their socialisation in a variety of ways in school and at home which can consequently impact on their social development. Existing research indicates that moderate computer use does not significantly impact children's social skills and relationships with friends and family either positively or negatively.

However it has been suggested that spending a disproportionate amount of time on any one leisure activity at the expense of others will hamper social and educational development (Subrahmanyam et al., 2000)

At the fore front of concern is the fact that excessive computer use may affect children's social development through 'social isolation'. By the age of seven, a child's social interactions with family, peers, school, community network, and media all play an important role in the development of interpersonal skills and social competence (Sheild & Behrman, 2000; Valkenburg, 2004). Concerns have been raised that children may be losing this social interaction and may be forming "electronic relationships" with the machine instead of friendships with their peers, hindering the development of interpersonal skills (Calvert, Jordan & Cocking, 2002; Subrahmanyam et al.,2000; Shiled & Behrman, 2000). Studies by Calvert et al. (2002) in US have shown that 20% of children aged between 8 and 18 report having a computer in their room, 11% have internet access and over 60% of all computer time is spent alone. These results indicate that the computer is often used in solitude, which consequently increases social isolation.

Concerns have also been raised regarding the effect of computers on social development in the school setting. According to Shield & Behrman (2000), although it is common for schools to use computers in a group setting, concerns have been raised about the possibility that computers may be used to replace child-to-child and child-to-teacher relationship.

Setzer and Monke (2001) believed that when children are being introduced to the computer at too early an age this is detrimental to a child's development. Consequently, Setzer and Monke recommended that students should not begin the formal study of computers until they are in high school. They based their opinion on Mortimer Adler's views of child development, recognising that children grow into their ability to handle abstract and complicated systems.

In other contexts, Buckingham (2000) describes positions such as this as adopting a 'death of childhood' thesis in which it is believed that childhood has been lost as a result of changes in modern society. Fuelled by a combination of panic and nostalgia, this has been a continuing anxiety over the last several decades but has found new expression in fears focused on children's use of ICT (Valentine & Holloway, 2001).

Besides that, at young ages, children's minds are very malleable and susceptible to persuasion. Ideas and morals are beginning to form and children are just beginning to conceptualise the difference between fantasy and reality. Things they see on a computer can easily be mistaken as real life situations. In 1997 the U.S. Census Bureau reported that seventy-five percent of children from ages six to eight were playing games on their home computers (Becker, 2000, p.65). Eighty percent of Nintendo and Sega Genesis computer games were primarily noted as aggressive and violent. Repeated playing of violent computer games have the potential to increase children's hostility and make them more accustomed to violent activity (Subrahmanyam, Kraut, Greenfield & Gross, 2000, p.132). In addition, most computer games are fast paced. The fast pace of computer games also encourages children to become easily impatient and impulsive which can lead to attention deficits and poor relationships with parents and peers. Wartell et al. (2000) summarised the link between violent content and aggressive behaviour as (i) identification with the aggressive characters; (ii) active participation and control over individual character's actions and (iii) reinforcement and reward of aggressive behavioural choices.

The appropriate age to begin computer use is also a hotly debated topic among educators. According to Kneas (1999) some educators believe all children age four and above should have access to computers. On the other hand, some educators argue that computer use by children under the age of seven takes away from times allocated to more meaningful activities. If young children are allowed too much time (i.e. more than one hour per day) on the computer, they miss prime opportunities to develop the personal, social and emotional skills they need to function effectively as adults (Healy, 1998). Determining an appropriate age of computer use by young children constitutes a major research issue for educators.

Other concerns focus on the physical effects of prolonged exposure to ICT, such as repetitive strain injuries, addiction and sedentary lifestyles. The BECTA (2001) leaflet on keyboard skills in schools states that using the keyboard with index fingers only is highly risky for children with years of typing ahead of them, especially when there may be added strain from playing games on home computers. Research on the possible addictive nature of the Internet and computer games has so far been limited to older children. However, ICT has been used to promote health and positive behaviours with games that encourage children to manage conditions such as asthma and diabetes (see http://www.starbright.org).

Although there are positive research findings on the effect of computers on children's language development, there are still criticisms of using computers with young children. Armstrong & Casement (2000) strongly argue against the over-use of computers in school. Their argument focuses on two main issues. Firstly, as spending on computer technology increases, school districts often have to reduce the funds available to purchase books (p.77). Secondly, they argue that when children look at electronic books, which combine the traditions of storytelling with the interactive attractions of multimedia, the visual excitement of software can actually impede reading development. They state that "electronic books will lead to less attention being paid to the story itself and will therefore do less to develop listening and reading skills than the traditional activity of reading aloud"(p.85)

Many have pointed out that computer use requires much less physical activity on the part of the child than other activities. Hohman (1998, p.60) states that "except for the coordination involved in moving and clicking the mouse, computers don't, as yet, support a particularly wide range of motor activities development. Touch typing is a motor skill that can be learned with the help of a computer, but inappropriate for most children before second grade. Besides that many have pointed out that computer use requires much less physical activity on the part of the child than other activities; "compared with finger painting or a trip to the apple orchard, computer activities are certainly less physically active and less rich in sensory stimuli" (Hohman, 1990, p.10). At this point it is almost universally understood that "in United States, children are getting less fit by the year, and obesity rates among young children are increasing" (Healy, 1998, p. 121).

The belief that computers may damage young children's development also underlies educational concerns. Healy (1998), for instance, claims that the early years are a 'busy time for the brain' and using computers before the age of seven subtracts from important developmental tasks. She states that learning to use computers uses up cognitive resources that could be applied to other types of learning. However, a review of developments in neuroscience and their implications for research on learning (Blakemore & Frith, 2000) concludes that while it is true that pre-school children have brains that undergo substantial and rapid changes 'this increased flexibility remains throughout adolescence, at least in some brain areas' (p. 10).

Finally, a strong critic of computers, the Alliance for Childhood (2000) claims that computers put children at risk for Repetitive Stress Injuries (RSIs), eyestrain, and obesity, social isolation, and for some, long term damage to physical, emotional or intellectual development. Regarding the use of technology for children in early childhood and elementary education, they claim, "For a relatively small number of children with certain disabilities, technology offers benefits. But for the majority, computers pose health hazards and potentially serious developmental problems." One of their main contentions is that use of technology weakens the social and emotional bonds between children and the world and this necessarily inhibits the development of the child at that early age.

> "Too often, what computers actually connect children to are trivial games, inappropriate adult material, and aggressive advertising. They can also isolate children, emotionally and physically, from direct experience of the natural world. The "distance" education they promote is the opposite of what all children, and especially children at risk, need most close relationships with caring adults". (Alliance for Childhood, 2000)

In conclusion, preschoolers need stimulating and safe environments managed by adults who allow them to act physically, mentally, and emotionally on objects and who provide them with concrete objects and experiences that promote development. Because computers are such a central component of our society, a good pre-school today and in the future must include one or more microcomputers. Teachers in those pre-schools must be computer-literate and able to teach computer literacy skills to young children. Early childhood educators must now consider how much of the early childhood curriculum should be experienced by children via the computer and how much through traditional play. Several advantages and disadvantages of the use of the computer in pre-school are evident and must be taken into account by child advocates, teacher educators, early childhood teachers, and parents. They must focus on young children's needs for optimum development and the advantages and concerns relative to the use of computers with pre-schoolers. Therefore, this research study seeks to examine the impact of computer play on the social interaction behaviour of pre-schoolers by looking at young children's social interaction with peers. This research has provided important information and has been necessary for developing a better understanding of early childhood development in general and social development in particular..

4.6 Conclusion

Computers are very important parts of our lives and will probably be more important in the future. Over the last two decades, they have been increasingly present in early childhood education settings. As Clement (1999) states, towards the end of the 1980s, in US only one quarter of licensed pre-schools had computers, and he continues that today almost every pre-school has a computer, with the ratio of computers to student from 1:25 in 1984 to 1:22 in 1990 and 1:10 in 1997 (Clement ,1999). This last ratio shows us that computers have became a part of early childhood education settings. Therefore, teachers of early childhood education need to be familiar with the latest computer technology in order to make use of its advantages for young children. In their position statement "Technology and Young Children – Ages Three Through Eight" the NAEYC (1996) states that "As early childhood educators become active participants in a technological world, they need in-depth training and ongoing support to be adequately prepared to make decisions about technology and to support its effective use in learning environments for children". What early childhood teachers know about and think about computers and computer use for young children will likely affect what early childhood teachers implement in the early childhood setting.

Chapter 5: Research Methodology

5.1. Introduction

This chapter explains the procedures and methods used to conduct the data collection and data analysis of the study. It also includes an introduction dealing with the definition of the term "research into early childhood education". The introduction is followed by a number of sections dealing with the choice of research design, the pilot study, initial procedures undertaken prior to data collection, data collection (observation and semi-structured interview), the reliability and validity and finally the data analysis.

5.2. Methodological issues

One methodological issue of the study arises out of the use of children as informants. Samantha Punch (2000) argues that there are clear differences between research with children, particularly young children, compared to research with adults. She suggests that in the critiques of developmental psychology by the new sociology of childhood: "There has been a tendency to perceive research with children as one of two extremes: just the same as or entirely different from adults." Elsewhere she notes:

> It is somewhat paradoxical that within the new sociology of childhood many of those who call for the use of innovative or adapted research techniques with children, are also those who emphasise the competence of children. If children are competent social actors, why are special 'child-friendly' methods needed to communicate with them? (Punch, 2002:322 and 321)

Some researchers believe that children possess characteristics that make them different and problematic as informants in research. This issue will be discussed further.

5.2.1. Children as different from adults as informants

Researchers, particularly those who work within paradigms that conceptualise the child as a developmentally immature adult, believe that children are not capable of being reliable informants in research. In general these researchers argue that the younger the children the greater the problem with their participation. Some of the commonly described characteristics deemed to contribute to the problem are their inability to think and interact at a propositional level, their inability to understand what is being asked of them, their inability to articulate their understanding of something that they may not have expressed before, their inability to tell 'truth' from 'fiction', and their eagerness to please adults, particularly in a school (Mayall, 1994).

Contrary to the belief that these characteristics differentiate children from adults as research participants, many childhood studies researchers (Mayall, 1994; Oakley et al., 1994; Solberg, 1996) believe that these are essentially the very same issues. Consequently all researchers need to take account of these issues regardless of the age of the participants and that attending to these issues on behalf of all participants is a professional responsibility. Oakley et al. (1994) takes this line of argument even further through her proposition that mainstream research with adults has not always attended to these matters, and through the identification of special groups of 'the researched' such as women, ethnic minorities or children, issues such as these were thrown into relief and have resulted in higher ethical and professional standards being used right across the spectrum.

A range of strategies was employed by the researcher in this doctoral study to take account of the fundamental questions regarding the relationship between the researcher and the participant but not in a way that highlighted the 'childlike' qualities of the informants. This is not to imply that due care was not taken to address specific issues, but rather, throughout the study the same principles were applied to all participants, adults and children alike. Simple examples of these can be seen in the way the researcher, as part of her greeting of all participants, reminded them of their right not to take part, to withdraw at any time or to choose not answer any particular questions. Furthermore, the researcher took care to sit in a way so as to provide 'comfortable' eye contact with participants, which in some cases required the researcher to sit on a low chair or on the floor during observation and interviewing.

The researcher did not stipulate any specific qualities or characteristics of the children as a condition of their participation in the current study. The children were not subjected to examination or analysis of any sort before, during, or after the observation. It was expected that each child would have a unique combination of personality, temperament, biological functioning, and learned experiences, among other factors, that would contribute to his or her psychological habitat and subsequently, impact on situations to produce different behaviours. Besides that, the participating children were also not stratified by language, understanding of basic concepts, or other forms of testing. In terms of culture, the researcher was also concerned about the different cultural aspects such as family and Social Economic Status (SES). Therefore in relation to this, the SES is one of the criteria for choosing the selected pre-schools in this study.

5.3. Research methodology

This study focuses on in-depth descriptions of children using computers in pre-school classrooms in Malaysia. It "seeks answers to questions that stress how social experience is created and given meaning" (Denzin & Lincoln, 2003, p.13), and establishes "in depth how things were at a particular place at a particular time" (Stake, 1995, p.38). In the first part of the chapter reasons for adopting a qualitative research approach, using a case study design, for data collection are discussed. The perspectives and paradigms that underpin the research are made transparent. In the second part of the chapter, the design of the study is described.

5.3.1. Qualitative Design

Within the area of qualitative research there are, according to Miles and Huberman (1994, p.8) three general approaches to formal inquiry: interpretive, social anthropology and collaborative social research.

Interpretivists believe that human activity can be interpreted through some degree of detachment and understanding of their observations. These investigations include researchers such as phenomenologists, social interactionists and other interpretationists.

Social anthropology too is concerned with the immediate, naturalistic, descriptive study of a given community. Social anthropologists become involved with the everyday way of life, language and activities of their community. Through this process social anthropologists are able to refine and develop theories in relation to their observations and understanding of their community and their informants.

The third type of approach, collaborative social research, is a process in which both the researcher and subjects work together in real time in order to examine a mutual area of social interest.

It is important to note that this research uses a qualitative approach incorporating a case study research strategy. A qualitative approach is appropriate when the aim of the research is to seek the meaning of new phenomenon, in this case, computer use in the early childhood classroom in Malaysia. As noted by Creswell (2003:22), 'if a concept or phenomenon needs to be understood because little research has been done on it, then it merits a qualitative approach'. Similar points also arise from Gillham (2000a:11) that qualitative research enables the researcher 'to investigate situations where little is known about what is there and what is going on' and 'to explore complexities that are beyond the scope of more controlled approaches'.

In this case, the significance of the qualitative approach is that it is exploratory and so is useful when the researcher does not know which variables to examine (Creswell, 1998, 2003). According to Denzin and Lincoln (2000:10) a qualitative approach is 'concerned in capturing the individual's point of view' and 'securing rich descriptions'. In comparison, they argue that 'quantitative researchers are deliberately unconcerned with rich descriptions because such detail interrupts the process of developing generalisations'. Therefore, qualitative and quantitative approaches have different aims. In this context, Patton (2002:14) notes that:

> 'Qualitative methods facilitate the study of issues in depth and detail. Approaching fieldwork without being constrained by predetermined categories of analysis contributes to the depth, openness and detail of qualitative inquiry. Quantitative methods, on the other hand, require the use of standardized measures so that the varying perspectives and experiences of people can be fitted into a limited number of predetermined response categories to which numbers are assigned.'

The advantages of the qualitative compared to the quantitative approach is highlighted as it is seen to be the preferable method and consistent with the aims of this research.

Creswell (1998:74) notes that there are five philosophical assumptions that guide the design and are central to all good qualitative studies. These assumptions relate to the nature of reality (the ontological issue), the relationship between the researcher and that being researched (the epistemological issue), the role of values in a study (the axiological issue), the language of the research (the rhetorical issue) and the process of research (the methodological issue). These philosophical perspectives provide guidance to the researcher when considering similar issues which underpin the whole process of the research. The following section discusses the advantages of the qualitative approach, using a case study strategy, adopted for this research design.

As discussed in section 1.2, and 1.3, this research examines the phenomena of computer use as one of the important factors for the development of children's social interactions in four pre-schools in Malaysia. Therefore, the nature of this research is explanatory, exploratory and descriptive.
In relation to this, the justification of using a case study strategy for this research is based on the existing literature, and its advantages compared to other research strategies. Yin (2003:1) notes that case studies are commonly used as a method for researchers to include aspects of investigations in the psychology area.

> 'Not surprisingly, the case study has been a common research strategy in psychology, sociology, political science. Case studies are found even in economics, in which the structure of a given industry or the economy of a city or a region may be investigated by using the case study method'

In comparison to other research strategies Yin (2003) has outlined that the case study is preferred as a research strategy when three conditions or situations are present:

i. When the question of 'how' and 'why' is the focus of the study.
ii. When researchers have limited or little control over events being studied.
iii. When there is a focus on examining contemporary phenomenon.

All three conditions pertain to this study. It is clear in the research statement and research questions that 'how' and 'why' are the key questions being addressed when identifying the position of computer use in the Malaysian pre-school classrooms. As discussed by Yin (2003), the question of 'how' and 'why' are posed in order to be more explanatory, which is similar to the nature of this research. This research also indicates that the questions are examining contemporary events over which the researcher has little or no control. In this case, examining computer use is a contemporary event occuring in Malaysian pre-school classrooms. The researcher has no control over the subject. These conditions and situations are also relevant when compared to the dimensions in the five research traditions in qualitative research as outlined by Creswell (1998), in which the focus, discipline origin, data collection, data analysis and narrative form for this research are preferable when conducted through the case study approach.

Compared to other research strategies, the case study is used for investigations in which the cases are relatively small (sometimes just one), where the information to be gathered and analysed is about a large number of features in that particular case (Hammersley & Gomm, 2000). Thus, it can be concluded that the case study is preferred when the research requires the understanding of the whole context of the phenomenon that has been studied. This reflects the nature of the research reported here, where the use of the case study approach as a research strategy will be able to provide an analysis of context and process involved in the phenomenon within the selected case study.

Yin (2003:2) argues that case studies derive from the need to understand complex phenomenon that 'allows investigations to retain the holistic and meaningful characteristics of real life events – such as individual life cycles, organisational, and the maturation of industries'. Again, it is reasonable to suggest that the selection of a case study as a preferred research strategy is in line with the nature of this research. The integration of the real-life (children in the pre-school classroom context) and the phenomenon (computer use) to be studied becomes the key to exploring and understanding the case. As highlighted by Hartley (1994:208), case study research 'consists of detailed investigation, with a view to providing an analysis of the context and processes involved in the phenomenon under study'. Thus, it is likely to be an appropriate choice if there is a need to develop understanding within a context, in which the dynamics of the phenomenon need to be incorporated. This is especially the case when the intention is to explore a phenomenon, which is relatively new, or little understood at present. The advantage is, as noted by Berg (2004:251) that 'extremely rich, detailed and in-depth information characterise the type of information gathered in a case study'.

Merriam (1998) points to three characteristics of case studies, particularistic, descriptive and heuristic. This study is particularistic because it focused on how children and teachers use the computer in a pre-school setting. It can be defined as a descriptive case study because the intent of the study is to better understand the process of computer use in early childhood classrooms. It allows the researcher to present a detailed account of the phenomenon under investigation and is appropriate when presenting basic information on areas of education where little research has been conducted (Meriam (1998). It also relies on the teachers' and children's word to provide a thick description of their interactions. Finally, the study is heuristic because it is dependent upon interpretation of the collected data.

According to Merriam (1998:27-29), case study research also can be described by the nature of the final product, or report. These are:

i. A descriptive case study, which provides a detailed account of the particular phenomenon that has been studied.
ii. An interpretative case study, which also contains a detailed account of that particular phenomenon, but is characterised to a greater extent and degree by abstractions and conceptualisations that are derived from the findings.
iii. An evaluative case study, which not only consists of both aspects above, but also incorporates the element of judgment.

Nevertheless, there is prejudice about the value of the case study as a research strategy. According to Yin (2003), it has been claimed that case studies do not follow systematic procedures, or have allowed equivocal evidence or biased views to influence the direction of the findings and conclusions. However, this is arguably not true as discussion of case study research has expanded compared to ten years ago, at which time the existence of literature about the case study method was limited in terms of specific procedures to be followed and practical examples of its use. The second concern is the ability of the case study to provide a basis for scientific generalisation, especially when based on a single-case study. In this context, Yin (2003:10) argues that the case study does not represent a 'sample', but is intended to 'expand and generalise theories (analytic generalisation) and not to enumerate frequencies (statistical generalisation)'. Similarly, Stake (1995:4) notes that:

> 'Case study research is not sampling research. We do not study a case primarily to understand other cases. Our first obligation is to understand this one case'

Hammersley and Gomm (2000:3) note that case study research 'should be to capture cases in their uniqueness, rather than to use them as a basis for wider generalisation or for theoretical inference of some kind'. Clark *et al.* (1998:103) also point out that the issue of generalisation is less important if the results can be compared against existing studies in order 'to strengthen the validity of theories, help identify other cases to which the results are generalisable, suggest refinements of theories – or falsify them completely'. Likewise, Bromley (1986:22) notes that the case study is said 'to provide insight into, rather than confirmation or refutation of, a law or principle (derived from a theory)'. In this case, case study research is valid if the results or publication of the findings contribute further to existing knowledge. The discussion in the next section will address further answers to this issue, in particular with regard to this research and its use of multiple case studies.

5.3.2. Multiple case studies as the Research design

Whilst there are various explanations and definitions of a case study (Miles & Huberman, 1994; Stake, 1995, 2000; 1992; Yin, 1994), Merriam (1998) describes it as an "intensive holistic description and analysis of a single, bounded unit" (p.193). The unit in this study is pre-school children's social interactions at the computer in pre-school classrooms. The decision to use a case study strategy is raised by Merriam (1998) who claims it focuses on (a) meaning in context and (b) developing understanding of the case from the perspective of those being studied. These two points are in keeping with the researcher's intention of understanding children's social interactions when using the computers, and in developing an understanding of teachers' perceptions of pre-school children's use of computers in the pre-school setting.

Various researchers have also suggested several types of case study (Merriam, 1998; Stake, 1995, 2000; Yin, 1994). Multiple case study or collective case study (Stake, 2000), as opposed to a single case study, involves "collecting and analysing data from several cases and can be distinguished from the single case study that may have subunits or sub cases within" (Merriam, 1998, p.40). Further, using multiple case studies strengthens the "precision, the validity and stability of the findings" (Miles & Huberman, 1994, p.29) by looking at a range of similar and contrasting cases. The researcher is guided by these recommendations and adopted a multiple case study strategy by studying social interactions behaviour in four Malaysian Government Pre-schools. Bogdon and Bilken (2003) state that: "When a researcher studies two or more subjects, settings, or depositories of data, they are usually doing what we call multi-case studies" (p.62).

Multiple case studies are also appropriate in this study where the aim of the research is to expand the cases which apply to this research. (discussed further in section 5.7). As noted by William (2005:210) "A multi case study may begin as a single case and then be expanded to two or more cases. The added settings or cases may be included to enhance the generalisability of the research. The additional sites or cases may involve some diversity in order to provide a greater range of observations (William, 2005).

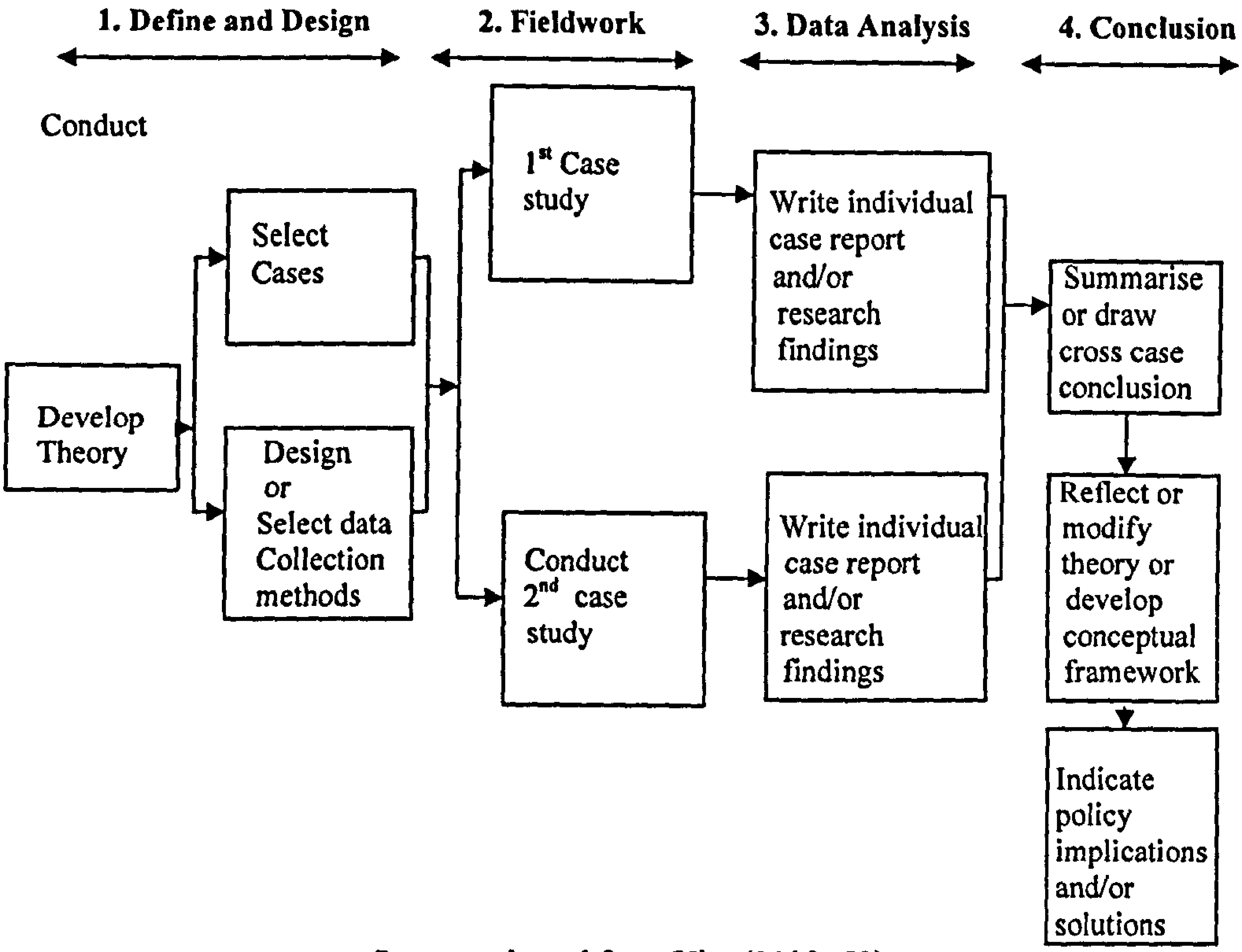
Figure 5.3-1 shows that there are four stages or phases in designing multiple case studies in this research (Yin, 2003: 49-50). These are:

Stage 1 - the define and design phase, in which the initial step in designing the study must consist of theory development, case selections, data collection method and process specifically.

Stage 2 - conducting the fieldwork according to each individual case study. Each individual case study is considered as a "whole" study, in which convergent evidence is sought regarding the facts and conclusion for the case.

Stage 3 - data analysis. All the individual case results can and should be the focus of a summary report for the research findings. For the individual case, the report should indicate how and why a particular proposition was demonstrated (or not demonstrated). The purpose of this proposition, however, is not to make a complex statistical test or to test the theory with collected data, but as a guidance or a focus for this research as mentioned earlier.

Figure 5.3-1: Case Study Method

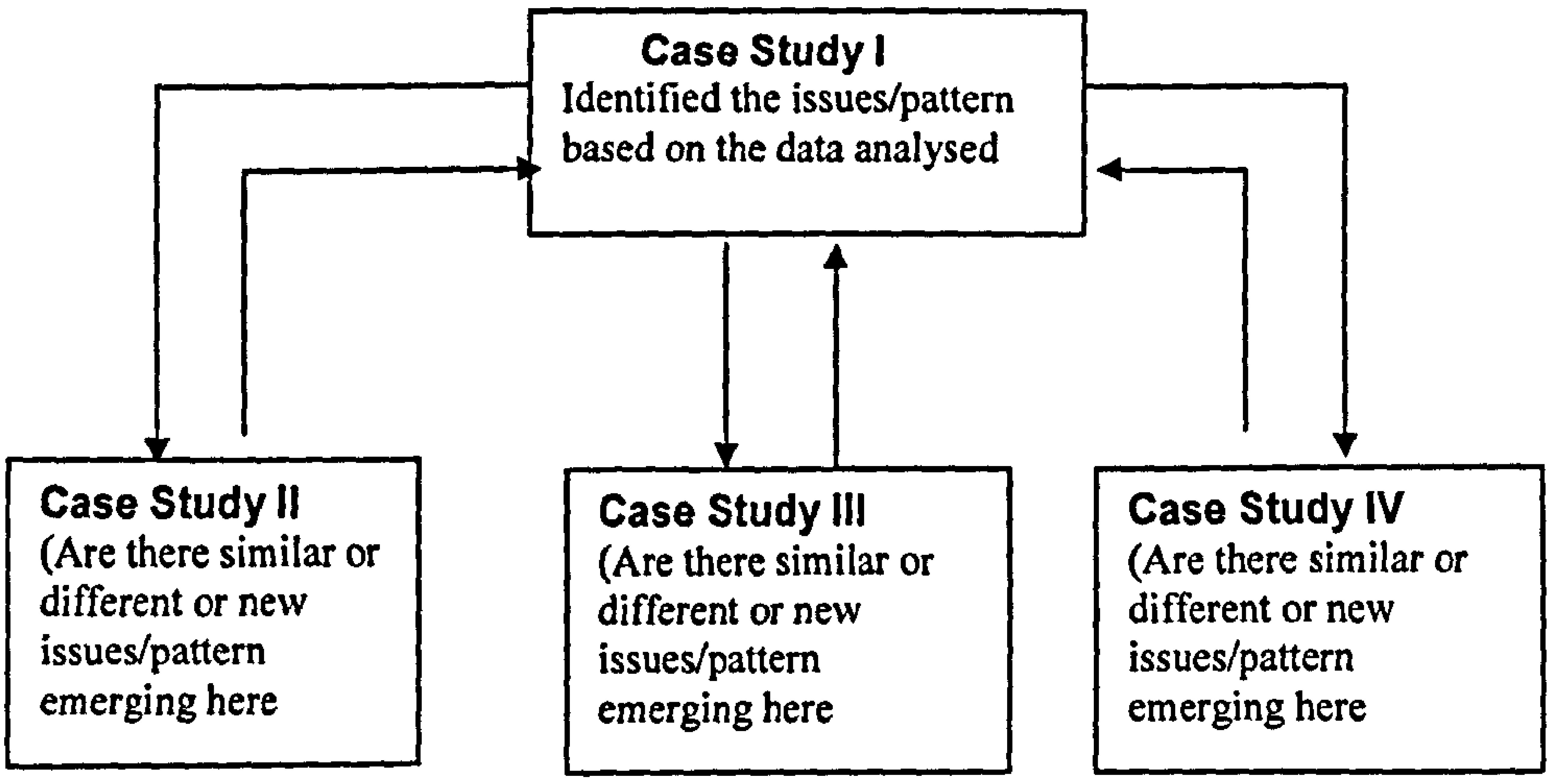


Source: adapted from Yin, (2003: 50)

By adapting Yin's multiple case studies suggestion, figure 5.3-2, presents the researcher's theoretical framework for this study. As mentioned in chapter one, the aim of the research is to investigate the children's social interaction in four cases, beginning with an in-depth study in pre-school A (case study 1). The information gathered from case study 1 (Pre-school A) is used as a foundation to do research on other individual cases (Case II, Case III and Case IV). Each case is then to be analysed individually and the researcher will identify whether similar or different or new issues emerge here. Finally, across the cases, the researcher will indicate why certain cases produce certain results, whereas other cases, if any, produce contrasting results.

The researcher notes that a multiple case study approach should not be confused with other case studies such as a comparative case study (Merriam, 1998). Thus, this study does not qualitatively compare analyses from one case to the next, but uses one case to provide an interpretive context for the others (Chow-Hoy, 2001). Yin (1994) argues that the logic underlying the selection of a multiple case study approach is crucial. Each case must be selected so that it (a) predicts similar results, or (b) produces contrasting results but for predictable reasons (p.269). Since each school varied in terms of its socio-economic stance, size, and student composition, it was unlikely that the study would produce similar results. Instead the case was grounded because it set parameters to the applicability of the theory, fitted the situation that was being researched and sought to address confirmatory and contradictory results (Cohen, Manion, & Morrison, 2000).

Figure 5.3-2: Multiple case studies theoretical framework



Merriam (1998) also argues that case studies can be described by the overall intent of the study. They can be (a) descriptive which is a detailed account of the phenomenon under study; (b) interpretative which is used to develop conceptual categories or to illustrate, support, or challenge theoretical assumptions held prior to the data gathering, or (c) evaluative which involves description, explanation and judgment. The researcher's intention was to provide rich descriptions of children's social interactions behaviour during computer use and to interpret teachers' conceptions of pre-school children's computer use which would form a database for future comparison and theory building.

Merriam (1998) asserts that the more cases included in a study, the more compelling the interpretation is likely to be. In addition, she reveals that the inclusion of multiple cases enhances external validity of the study. Four cases were carefully selected in order to observe whether the integration of computers in the four pre-school classrooms investigated produced similar or contradictory results. Moreover, the flexibility of this research design provided an opportunity for the researcher to modify and improve research strategies in case studies II, III and IV.

This study gathers data from different participants and at different points in time. The participants involved were from four pre-schools (case study 1-pre-school A, case study 2-pre-school B, case study 3-pre-school C and case study 4-pre-school D).

5.3.3. Strengths and limitations of using a multiple case study

The bounded aspect is the single most defining characteristic of the case study strategy (Merriam, 1998; Stake, 2000). It involves "phenomenon of some sort occurring in a bounded context" (Miles & Huberman, 1994, p.25). The boundaries of this study are clearly defined in the design of the study, with its limitation of four school sites, eight teachers from the schools, and 46 pre-school children working at the computers. Stake (1995) identifies three types of case study—intrinsic, instrumental and collective. This study is collective because the researcher aims to describe how computer use is organised by teachers across a range of schools. It is not intrinsic because the researcher has no vested interest in the case, nor is it instrumental because it does not seek to understand anything more than how teachers and children use the computers in the selected schools.

The study is limited by the temporal nature of the phenomenon being studied. The study focuses on how computers are used in pre-school classrooms at the present time. Learning and teaching are evolving processes, thus by the time conclusions are drawn from this study, the situation in schools using ICT is likely to have changed.

5.4. Paradigms and Perspectives Underpinning the Research

It is important for researchers to address the paradigms, or knowledge claims that underpin their research. This is because 'researchers start a project with certain assumptions about how they will learn and what they will learn during their inquiry' (Creswell, 2003:6). Several qualitative researchers (Denzin & Lincoln, 1994, 2003;

Guba & Lincoln, 1994; Merriam, 1998; Miles & Huberman, 1994; Neuman, 1997; Stake, 1995; Yin, 1994) have informed the paradigms the researcher has adopted to frame her research in this study. Munby and Russell (1992) are adamant that researchers need to make explicit the paradigms and perspectives that frame their work. Guba and Lincoln (1994) define a paradigm as:

> A set of basic beliefs that deals with ultimates or first principles. It represents a world view that defines, for its holder, the nature of the "world", the individual's place in it, and the range of possible relationships to that world and its parts. (p.107)

Thus, paradigms are human constructions that define the world view of the researcher and have "important consequences for the practical conduct of inquiry, as well as for the interpretation of findings and policy choices" (Guba & Lincoln, 1994, p.112).

Guba and Lincoln identify and define four paradigms—positivist, postpositivist, critical theory and constructivist. The researcher rejects the postivist and postpositivist beliefs that "reality is stable, observable and measurable" (Merriam, 1998, p.4) since education is a process and the school a live experience. Multiple realities are co-constructed by teachers and students and understanding the meaning of the process involves the inquiry mode of inductive reasoning. Understanding these realities involves the interaction of the researcher and the participants, and is thus subjective. Since the goal of this study is not to seek a common point of view and to transform events that take place in the classroom, the researcher also rejects the critical theory paradigm. The researcher believes that individual constructions need to be elicited and refined hermeneutically, thus reconstructing the "world" at the only point at which it exists—in the minds of constructors. Thus the researcher takes a broadly interpretative approach that is found more specifically in a constructivist paradigm.

5.4.1. Constructivist paradigm

Most contemporary qualitative researchers believe knowledge is constructed rather than discovered (Stake, 1995). Guba and Lincoln (1989) describe the constructivist paradigm as interpretative or hermeneutic, creating meaningful constructions through interaction of individuals and groups. In their view "there is no reality except that created by the people as they attempt to make sense of their surroundings" (pp.12-13). To prepare an interpretation, the researcher must construct a reading of these meanings and thereby "offer the inquirers construction of the constructions of the actors one studies" (Schwandt, 1994, p.118). The constructivist paradigm is closely connected to the subjectivist and transactional stance of the researcher with the inquirer as the "orchestrator and facilitator of the inquiry process" (Guba & Lincoln, 1994, p.114). The researcher acknowledges that multiple "knowledges" can coexist and that social realities can change as constructors become more informed. The constructivist paradigm is significant to the study on two levels. Firstly, it is one of the theories that underpins Malaysia's National Pre-school curriculum (Chapter 3) and as such has relevance for the teachers in this study. Secondly, the study is consistent with contructivism's aim of *understanding and reconstruction* (Guba & Lincoln, 1994). With the researcher's role as an observer, incidences of children's social interaction when using the computer will be examined and reconstruction of the meanings that emerge from the data analyses will be presented.

5.5. Selection of the school settings

The researcher selected four pre-schools, wanting to provide "information-rich cases" where one can "learn a great deal about issues of central importance to the purpose of the research" (Patton, 1990, p.169). Miles and Huberman (1994) and Merriam (1998) emphasised the importance of making a proper selection of the case, since the purpose of a case study is not to represent the world, but to represent the case. The size of the sample was not restricted by the need to have a large enough population for statistical analysis. On the other hand, the sample was of a size that provided a variety of situations where it was possible to conduct an in-depth study on how teachers incorporate computers into their pre-schools and the children's social interactions at the computer in the classrooms.

All pre-schools are government sponsored and the schools are administratively organised the same way (Pre-school A, B, C, and D). It should be noted, however, that the schools should not be thought of as representative of all pre-schools in terms of the computing resources available and their placement in classrooms, nor should the teachers who have participated in the study be considered representative of all teachers in these schools or of teachers in general. For identification purposes, when discussing each of the pre-schools, each pre-school will be referred to as Pre-school A for case study 1, Pre-school B for case study 2, Pre-school C for case study 3 and Pre-school D for case study 4. To concur with Stake (1995), the anonymity and confidentiality of the study's participants are essential considerations. Therefore, the names of pre-schools, teachers and children are replaced with pseudonyms.

Using "maximum variation sampling" which Merriam (1998) refers to as "widely varying instances of the phenomena" (p.63), the pre-school sites were purposefully selected on four criteria. It was anticipated that by looking at a range of similar and contrasting case studies, the external validity or generalisability of the findings could be enhanced (Merriam, 1998).

The pre-schools had to meet the following criteria:

1. Only involve children aged between 5 years one month to 5 years 11 months;
2. Have at least one teacher involved in the classroom activity;
3. Involved the use of computers during free play period.
4. Majority of the children come from a middle Socio-economic background.

Details of the school settings from which the data were collected and the method of data collection are described in the following sections.

5.5.1. The participants in the study

The issue of ethics is intrinsic to the constructivist paradigm (Guba & Lincoln, 1994) because of the inclusion of participant values. In keeping with this, the researcher revealed all details of the aim and intent of the study to principals, teachers and students and was consciously aware of problems of confidentiality and anonymity that arose.

The teachers in the study were involved in the semi-structured interviews and observation sessions.

5.5.1.1.Participating teachers in the study

Their ages ranged from 25 to 36 years old and some have taught between five and 10 years, and the others have taught for less than five years. All the teachers completed their secondary education and received pre-school teacher training as part of that programme Some went on to college, although attending college is not required for teacher certification in Malaysia. Pseudonyms of teachers who were involved in this study are indicated in appendix V.

It is important to note here that all the teachers were originally nominated by their principals to be involved in the study. Fontana and Frey (1994) recommend that "close rapport with respondents opens doors to more informed research" (p.367). All participants satisfy Merriam's (1998) criteria of good respondents who "can express thoughts, feelings, opinions—that is offer a perspective—on the topic being studied" (p.85). Since the researcher's primary goal is to add to knowledge, she was conscious of 'observer bias' (Bogdan & Biklen, 1992) and attempted to refrain from making assumptions about her views and allowed the teachers' observations and opinions to surface.

5.5.1.2.Participating students in each pre-school

Written parental permission was received for students involved in the study. Pseudonyms of students who were involved in this study are indicated in appendix V. In stage one and stage two all the children were involved in the study. However in stage three only the targeted children were involved. Each stage is explained in detail in section 5.7.

5.5.1.3.Principals/senior staff

There were two Principals to be interviewed. Their role in this study was minor and limited to obtaining perceptions of the integration of computers into pre-school classrooms.

All the pre-schools were purposely selected as representative of pre-schools that had computers and used the computer in their daily activities. Creswell (1998) pointed out that the purposeful selection of participant is a key element in qualitative research. According to Patton (1990) "the logic and the power of purposeful sampling lies in selecting an information rich case for study in depth. Information rich cases are those from which one can learn a great deal about issues of central importance to the purpose of the research" (p.169). The selected pre-schools, from which this sample was drawn, did not necessarily represent those who modelled best practice of computer use.

Secondly, the size of the sample was not restricted by the need to have a large enough population for statistical analysis. The size of the sample on the other hand, provided a variety of situations where it was possible to conduct an in-depth study on how teachers incorporate computers into daily activities in the classroom.

Simpson and Tuson (1995) clarified that the size of the sample for observation has less effect on the reliability of data collected by saying:

> 'Gathering and processing observation data are labour-intensive activities; the sample size in any such study is usually quite small. However, a small sample does not necessarily make the research unsound'
>
> (Simpson and Tuson 1995, p.26).

5.6. Time line for the Case study

Case study 1 began in early September 2005 and was complete in late October 2005. Each stage had a data collection phase. Table 5.6-1 presents the time line for each stage of case study 1 and table 5.6-2 presents the time line for each stage of the case studies II, III and IV.

Table 5.6-1: Time Line for the Case study 1-(Pre-school A)

Stage	Date
Stage one	13 Sep-23 Sep 2005
Stage two	26 Sep- 7 Oct.2005
Stage three	10 Oct-4 Nov 2005

Table 5.6-2: Time for case studies II, III and IV

Case study	Date
Case study II- Pre-school B	1 May - 5 May 2006
Case study III- Pre-school C	8 May -12 May 2006
Case study IV- Pre-school D	15May-19 May 2006

5.7. Data Collection Techniques

In keeping with the case study strategy, the researcher is the primary data gathering instrument (Stake, 1995). Merriam (1998) asserts the case study strategy involves the use and collection of a variety of empirical materials where data collection "is a recursive, interactive process in which managing one strategy incorporates or may lead to subsequent sources of data" (p.134). Thus, varied instrumentation enabled the researcher to look for consistencies across the findings. In addition, with specific reference to the case study, Yin (2003) and Gillham (2000a) list six sources of evidence that are commonly used in the case study, where each has it strengths and weaknesses. These involve documentation, archival records, interviews, direct/'detached' observations, participant observation, and physical artifacts.

> "Multiple source of information are sought and used because no single source of information can be trusted to provide a comprehensive perspective. By using a combination of observations, interview and document analysis, the fieldworker is able to use different data sources to validate and cross-check findings." (Patton, 1990, p.244)

To carry out comprehensive research about the use of computers in pre-school education and in the pre-school classroom there is a need to use more than one method of collecting data, which can be analysed, to obtain satisfactory results. Therefore the following research techniques have been used; observation, interviews, and document analysis.

As indicated in figure 5.7-1, the instrumentation included audiotapes of semi structured interviews with students, teachers and principals; observation fieldwork of students working at the computer and school and government documents.

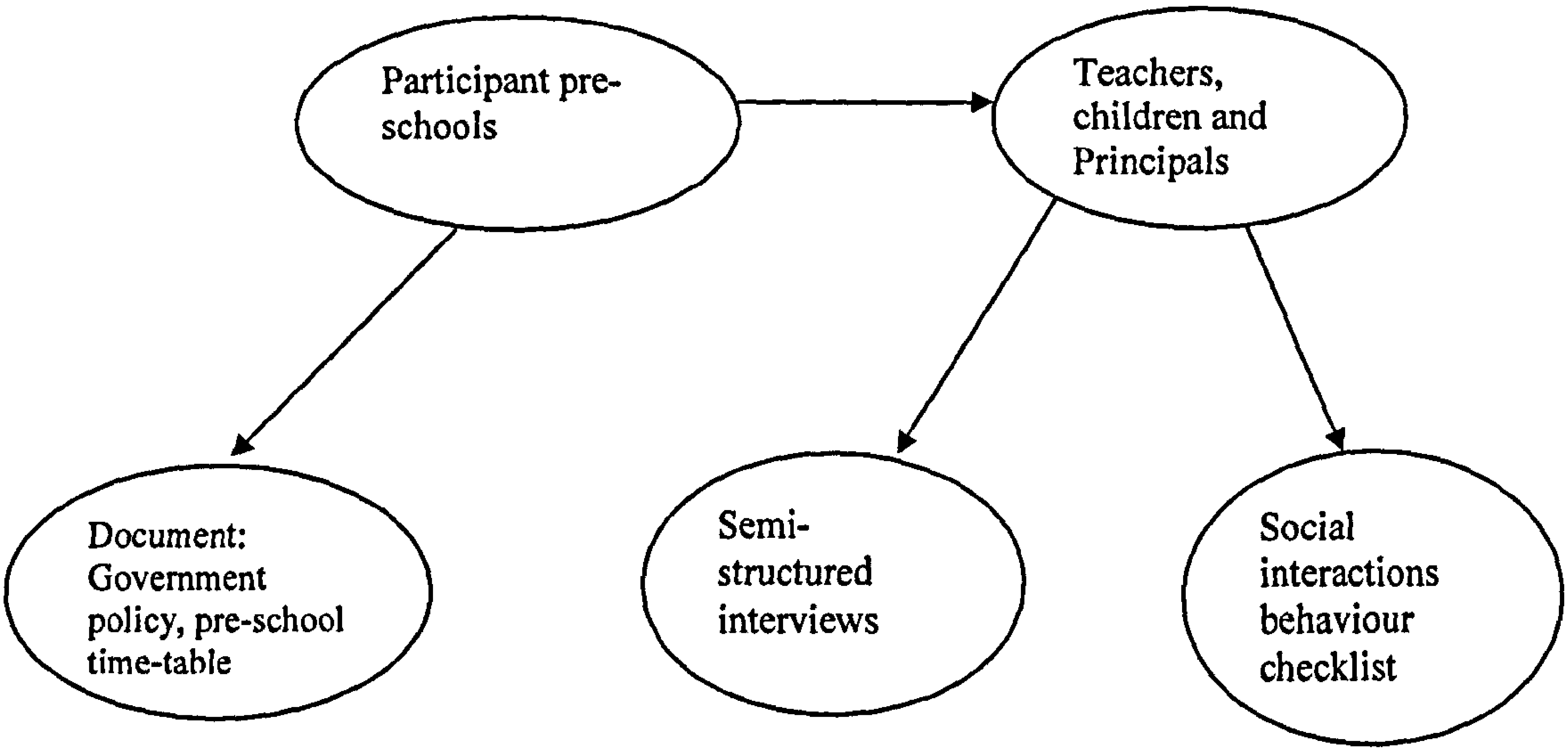


Figure 5.7-1: Overview of the instrumentations used in the data collection

5.7.1. Observation

In a sense, all research involves observation. If the purpose of research is to improve understanding of an individual, a relationship, a particular social group or culture, then the knowledge begins with observations. Observation means watching children individually, in relationships, in context and asking: what do they see, what do they feel, what do they think, and what do they do. This procedure empowers the child whose silent 'voice' is heard by a researcher. Historically, no other method of assessing children may have had as powerful an impact on the field of child study than that of observing. Not only can observations reveal much about children's growth and development, their perceptions of self and others, and their strengths and weaknesses, but they take place naturally and spontaneously.

Greg & Taylor (1999, 84) mentioned that "the process of observation takes the researcher on a personal voyage around her own perceptions, feeling, thoughts and actions which can be both disturbing and liberating".

Observation has been characterised as "the fundamental base of all research methods" in the social and natural sciences (Adler & Adler, 1994, p.389).

The observation technique has several advantages:

1) According to Leedy and Ormrod (2001), flexibility represents a main advantage of carrying out an observation. The observer can easily shift the concentration when any new event appears.

2) "Careful study of the children's classrooms provides teachers with the information to plan connected learning experiences that build on children's interest and allow for continued inquiry.....In the process, the teacher becomes a researcher with children. (Hughes 2002:134)

3) "Children can awaken in us an understanding of what it means to be inventive, engaged, delighted and determined to rearrange the world. If we listen to and watch them closely, they will teach us to be more observant, inquisitive and responsive in our overall work and overall lives" (Curtis and Carter, 2000).

4) Observations should be used to evaluate not only the developmental appropriateness of planned experiences but also the possible gender biases. "Such evaluation enables staff to plan an anti–bias curriculum suited to children's need, abilities and interest, and the particular gender politic of the group." (MacNaughton, 2000)

5) Compared to standardised tests, which interfere with children's natural end process, observations are neutral and inconspicuous and have the power to capture the real or pure nature of the child. (Smagorinsky, 1995).

6) and, according to Pelligrini (1996) observational methods are an important family of tools we use in understanding children.

In addition, other studies that are concerned with the computer use in the early childhood classroom have also applied similar methodological approaches and techniques (Perlmutter,1989; Muller and Perlmutter, 1985'; Padmore, 1991; Clements, Nastasi, & Swaminathan, 1993; Clements, 1994; Shade, 1994; Haugland & Wright, 1997; Lomangino, 1999; Mohamad and Down, 2001). These researchers use the case study as a strategy that includes a qualitative approach with a focus on observations and interviews. Thus, this research attempts to use observation techniques and interviews to gain information as discussed further in the next section.

Furthermore the experimental method was considered not to be feasible for the current study because the strength of the experimental method is the amount of control which experimenters have over variables. However, it must be noted that, it is not possible to completely control all variables especially when the study involves young children. There may be other variables at work or the place of the study which the experimenter is unaware of. In particular, it is impossible to completely control the mental world of people taking part in a study. Finally, it is also important to recognise that there are very many areas of human life which cannot be studied using the experimental method because it would be simply too unethical to do so.

However, Leedy and Ormrod (2001) also point out some of the disadvantages to observation methods. These are: researcher attendance may alter people's behaviour, recording events could be a problem, written notes are quite often insufficient to achieve the rich data of what is being observed and the presence of a tape recorder and a video camera may reflect negatively on a participant's comfort.

As Adler and Adler (1994) said " For as long as people have been interested in studying the social and natural world around them, observation has served as the bedrock source of human knowledge" (p.377). Therefore, in early childhood research, whether the research is primarily quantitative or primarily qualitative, observation is an appropriate and helpful technique.

As MacNaughton and Faragher indicate:

> "The first stage of observing is looking at what a child is doing. This may seem simple and obvious. However, the process of looking at what a child is doing is extremely complex. There are several different ways of looking at the same event or behaviour. Most of us are familiar with the fact that witnesses to a crime or an accident often have different recollections of what happened or have noticed different aspects of the same event. Observing young children is beset with the same difficulties."(Faragher and MacNaughton 1998:99)

There are two main types of observations - participant and non-participant (Bell, 1993). Participant Observation enables the researcher to observe what really happens rather than how people describe the event (Howe and Lewis, 1993). Thus participant observation is not simply observing the situation, but also involves listening to the people under study (Holloway, 1997). The ranges of participant observation vary from open to closed settings. Open settings are easier to reach such as people on the street and public places. Closed settings are more difficult to reach such as accessing management meetings and clinics etc., (Holloway, 1997). The non-participant observer exists when the researcher is not involved in the activities of the subject under study and records the events in a regular way (Cohen and Manion, 1995). For the purpose of the study, the role of the researcher is as "non-participant observer". (Discussed in section 5.12)

The principle data collection technique for this study was observation. The particular style of observations in this study was the systematic (structured) observation where the observer is systematically observing the behaviour of individuals in terms of a schedule of categories (Bryman 2004).

Structured, often also called systematic observation is a technique in which the researcher employs explicitly formulated rules for the observation and recording of behaviour. The rules inform the observers about what they should look for and how they should record. Each person who is part of the research is observed for a determined period of time using the same rules. These rules are articulated in what is usually referred to as an observation schedule, which bears many similarities to a structured interview schedule with closed questions.

The aim of the observation schedule is to ensure that each participant's behaviour is systematically recorded so that it is possible to aggregate the behaviour for all those in the sample in respect of each type being recorded. The rules that constitute the observation schedule are as specific as possible in order to direct observers to exactly what aspects of the behaviour they are supposed to be looking for.

Checklist for Structured observation of research

1. Clearly define the research question
2. Is the sample to be observed relevant to the research question?
3. Justify the sampling approach
4. The observation schedule indicates precisely which kinds of behaviour are to be observed
5. Observation categories should be designed so that there is no need for the observer to interpret what is going on
6. The categories of behaviour do not overlap
7. Pilot the observation schedule
8. Coding instructions must be clear
9. Should be easy to log the behaviour as it is happening. (Byrman, 2004:p.175)

5.7.1.1. Development of Observation in the Study

This part of the observation method covers the items to be observed, constructing the observation and piloting the observation.

a) Selection of the Observation Schedule Items

The research questions played a significant role in selecting the items of the observation schedule for both children and teachers in the selected pre-schools. Before identifying the elements to be include in the observation schedule, I used the research questions (in chapter one) which aimed to look at the effect of computer use on pre-school social interactions as the main elements to identify what I needed to explore through using the observation technique. Reviewing the literature on the effect of computers on pre-school children and related studies provided me with important data which was essential for the selection of the research elements. References on observation methodology were also reviewed and utilised a great deal. These provided guidance on how to design an appropriate observation schedule by consideration of the principles which need to be included or avoided.

I also made a preliminary visit to the setting in one of the selected pre-schools which I planned to carry out my observations. The objective of the preliminary observation was to:

1) To describe/layout what I saw about the:
    a) Setting
    b) Participants
    c) Children's behaviour
2) To learn about techniques for observing behaviour in a naturalistic setting
3) To discuss and define the children's social interactions
4) To layout the plan and groundwork for a 2 month observational study of children's computer use

As Pellegrini (1996 p.49) notes "the preliminary observation period enables the observers to specify more exactly the nature of the questions guiding the research". So the first phase of the preliminary visit involved observation of global patterns, durations, and frequencies of behaviour and related activity of entire pre-school classes going to and from classrooms. These were observed by means of ad libitum sampling, in which no pre-specified set of sampling rules were followed, which is particularly valuable during the initial phases of an observation (Pellegrini, 1996, p.154). In relation to this, the researcher used field notes to write down what was observed. Preliminary observations enabled researchers to develop specific hypotheses about the pre-school social behaviour during free play and work lesson. Thus events, patterns of behaviour that are relatively brief, will be the focus of attention (Martin & Bateson, 1993, p. 66) and the patterns of behaviour were charted according to time, number of children, origin and destination, and so on. This initial, global level of observation also included mapping of the environment, (LeCompte & Preissle, 1993, pp. 84, 113) including literally drawing maps of the hallways and rooms in the school site. This aspect of preliminary observation is sometimes referred to as "hanging around" (Pellegrini, 1996, p.123-124). Descriptions of the physical setting were supplemented by notations of traffic flow at various times of the day. The preliminary observation also allowed time for the children and teachers to get used to the presence of the observer in the classroom, thus minimising researcher effects for subsequent phases of research. Preliminary analysis during this phase involved the description of general behaviour patterns observed.

Through the preliminary observation, I identified and listed several types of behaviours that I might study. After that, I chose a single behaviour from the list and wrote down an operational definition for the targeted behaviour (play behaviour and social interaction). I was as specific, concrete, and objective as possible. A good operational definition allows a researcher to distinguish between relevant observations and those that should be discarded or ignored.

(b) Observation Construction

The observation was constructed in a checklist style in scaled categories. A copy of the observation schedule is in the appendix VIII.

In addition at the end of the observation, the checklist was left open for any further issues raised and to add any unpredicted issues or matters which could be utilised for the study.

Children's social interactions are based on one or more observations. If a behavior is not observed or if the child does not want to use the computer at the time of the observations, the child is observed on another day.

The observation schedule consists of four factors: -

Factor 1: Child collaborates with peers at the computer.

Factor 2: Child interacts with adult at the computer.

Factor 3: Child demonstrates unfriendly behaviour toward an adult in the computer area.

Factor 4: Child demonstrates unfriendly behaviour toward peers in the computer area.

c) Piloting the Observation

After piloting the original observation schedule construction some aspects were added and some changes were made. These changes were made in order to prepare the construction of the observation in a way that enables acquiring the required information and facilitates taking notes and recording events.

Samples of pilot data were analysed in the manner planned for the main data collection period. All data collected during the trial period was discarded and not included in the final analysis.

d) Conducting the Observations

A time sampling technique was used to observe children's peer interaction during computer play. Every 15 seconds, the child's social interaction behaviour was identified and was coded based on the scale which consisted of 5 (do you mean 4) categories, for a total of 14 samples in 10 minute observation intervals. The 15-second observations included 10 seconds for observation and 5 seconds for recording. Fifteen second observations allowed enough time for the observer to decide which type of play was occurring but also brief enough to be unlikely that two different types of behaviour to be observed (Johnson et al., 1999). When two types of social interactions behaviour occured within the 15-second interval observation period, the researcher selected the behaviour that lasted longest. Although other children were present during the computer use, the observer only observed one target child at a time.

5.7.1.2 Observation Stages

Overall all the observations were conducted in three stages. The following sections discuss each stage in detail.

A) Stage one

Purpose of stage one of the study

The purpose of this phase of the study was to get a "big picture" of the pre-school classroom, the playroom at work and have some background information about the context e.g nursery, children and staff. In this phase, the information I gathered was:

(1) Classroom layout

a. classroom size

b. physical layout

c types of learning centres in the classroom

(2) Information about the nursery

a. Number of children attending

b. Age range of children

c. Information about the nursery staff

d. Number of staff

e. Training/qualification background/experience

f. Time spent with the children and time on other tasks (e.g preparing material, cleaning up etc.)

g. Class timetable

(B) Stage two

Purpose of stage two of the study

Stage two of the study was designed to seek clarification of many issues raised in the first stage of the research. The following issues that were addressed were:

a) A day in selected preschool (preschool daily time table). The purpose was to get information about the routines and actions in the classroom.

b) Daily observation of children playing in the play centre. In this stage the children were observed during the free play period. The Children were allowed to choose their own activity during this time (approximately 90 minutes). In this stage, the researcher identified the child's social involvement, by noting whether the child was:

   i. playing alone or with peers or interacting with one or more adults ;
   ii. playing with same-sex peers, with opposite-sex peers, or with both same and opposite-sex peers;
   iii. identified the type of activity in which the child was engaged;
   iv. identified the children who never use the computers.

Since the intention of the second phase of observations was to get the overall picture about the children's activities during the free play period in natural preschool environments, the normal routines of the classrooms were not altered. Appendix VI presented the floor plan for the preschool playroom for each preschool.

C) Stage three

Purpose of stage three of the study

Stage three of the study was designed to extend the previous finding by having a closer look at the number of children who used the computer most during free play activities. The main purpose of this stage of the study was to look at their behaviour and to explain the interaction of children with peers, computers and teachers in the computer centre environment.

The teachers' and children's view about computer use were also explored as part of the task of analysing the educational implications of the findings of the doctoral study.

In this stage, the researcher focused only on the computer centre to have a closer look at:

1) Computer facilities in the classroom

a. Arrangement for computer use in the classroom:

b. resources

c. equal access to the computers

e. technical problems

2) Children's estimated times spent in the computer area.

3) Teacher's role in computer centre

a. teacher's estimated time spent at the computer area

b. teacher's active role/passive role

4) Children's social interaction (Observation Schedule Checklist)

a. child collaborates with peer at the computer

b. child interacts with adult at the computer

c. child demonstrates unfriendly attitude toward an adult in the computer area

For the purpose of the study the observation also took place during the free play period, but only for the target child at the computer centre. In three cases pre-school A, C and D, the computers were placed at the computer centre in the main activity room along with a range of other resources such as a water tray, nature table, or book display. In pre-school B the computers were placed in teachers room. Children were offered daily opportunities to use a computer during free-play periods.

In all cases, the children were observed during their free-play time in the morning which extended from approximately 10.00-11.30am. Since the intention of the study was to examine the social behaviour interactions in the natural pre-school environment, the routines of the computer centre and the free play area of the classroom were not altered.

In all the classrooms, the children were allowed to use the computer without a time limit because children need time to create and accomplish tasks on the computer. It also allows children freedom to create, explore and interact with peers. If the children were given a limited time to use the computer, it may make them feel rushed and uneasy, encourage aggressive behaviour, trying to finish before his/her turn is up. The children are free to choose when to play, choose a playmate and they can also choose which games/activity to play on the computer.

5.7.2. Interviews

Another data collection method used in this study was interviews. Patton (1990) reveals that, 'no single source of information can be trusted to provide a comprehensive perspective on the program' (p.244). Therefore, to cross check findings reported in observations, interviews with teachers and children were also conducted. In addition, the choice of this method of data collection was influenced by two ideas. First, Hewson and Hewson (1992) assumed that it is necessary to have either verbal or written forms of communication (not just actions) in determining the status of a person's conceptions. Second Bar (1987) showed that the only reliable method of testing young children up to the age of nine is the individual oral interview method. Data were, therefore, also collected through qualitative interviews. This qualitative method provided a rich context for exploring children's views about the use of the computer. It also permitted the researcher to gain access to the young children's individual meanings in the context of ongoing daily life. Through this approach to data collection, the researcher sought to develop rich pictures of the children's beliefs (Burns, 2000). Interviews were used to find out things that could not be directly observed, such as the teachers' and children's feelings, thoughts and intentions, thus finding out was going on their minds.

Furthermore, the interview method allowed the researcher to collect large amounts of information quickly and to uncover the participant's views about the topic of the study (Marshall & Rossman, 1999). Neuman (2000) identified the interview to be a short-term, secondary social communication between two unfamiliar persons with the clear purpose of one person obtaining specific data from the other. Data are acquired in a prepared conversation in which the interviewer asks pre-arranged questions and records the responses of the interviewee (Neuman, 2000). According to Neuman (2000) there are a variety of interview types, the most common being the face-to-face interview and the telephone interview.

Cohen and Manion (1995) stated that the purposes of the interview are many and varied. It can be used as a means of appraising, assessing or collating data (Cohen and Manion, 1995). Interviewing is no more valuable than many other data-gathering means such as questionnaires, direct observation etc. It is the most sociological of all the techniques because it involves deep dealings between the researcher and the interviewee (Hessler, 1999). In addition Bell clarified that a skilful interviewer can follow up thoughts, probe answers and explore motives and feelings, in a way which the questionnaire can never accomplish (Belll, 1993). Moreover methodologists emphasised that interviewing demands significant knowledge and training for effective performance. Interactive skills are also required to enhance the validity and reliability of the data (Hessler, 1999).

Although the interview method includes many advantages it has disadvantages and has the potential to be exposed to bias. Therefore some common factors can be described as follows:

1. In qualitative research the interviewer can influence the study both negatively or positively.
2. Lack of rapport or too much rapport between the interviewer and respondent could affect the result of the study.
3. An interview requires time. For instance the time for a qualitative interview varies from 45 minutes to an hour and half or more. This depends on the time available and staying power of the interviewee (Holloway, 1997). Moreover a semi-structured interview often takes between 45 minutes and an hour. This

is in addition to the time required by the researcher for travelling and for social talk. Furthermore processing the interview takes time. After conducting the interview the researcher needs to process the work. This may involve transcription of the interview, or detailed note taking from play back, followed by some kind of coding or other form of analysis (Drever, 1995).

In order to conduct a valuable interview that can reveal worthwhile data, the interviewer needs to make every effort to benefit from the advantageous features of the interview style. The interviewer also needs to be aware of the potential disadvantages of the interview technique used to avoid, or at least to keep to a minimal level their influence on the results. In this case study, interviews were used as they were perceived to be an excellent technique for collecting data with greater depth, breadth and detail than, for example questionnaires.

5.7.2.1. Design of Interviews in the Study

The stages of the design of the interviews used in this study consist of the selection of items to be presented in the interviews, constructing the interview and piloting of the interviews. Reviewing the literature on the use of computers in pre-school classrooms and related studies provided me with important data which was essential for the selection of the interview questions. Moreover references on interview technique were seriously considered. These presented directions on how to arrange proper construction of the interviews.

It was intended in the selection of the interview areas to cover elements that could help answer the research questions. In addition to the selection of areas for the interviews, the research questions again played an important role in identifying the issues to be raised in the interview questions. Therefore before identifying the elements of the interviewer's research questions (in chapter one) issues requiring investigation have been explored and sorted out into topics. The interviews were prepared in a way that could indicate the collection of essential information relating to the use of computers in pre-school classrooms in Malaysia.

5.7.2.2. The Interview Construction

The interviews have been prepared in a semi-structured style. According to Holloway (1997), the semi structured interview has a more detailed and focused agenda. Drever (1995) points out that, in the semi structured interview the interviewer sets up a general structure by deciding in advance what ground is to be covered and what main questions are to be asked. This form of interview allows for a more in-depth examination of the participants' perceptions, feelings, attitudes and belief about a smaller number of topics (Drever, 1995). It was appropriate as it provided the opportunity for the progressive focusing of topics that were needed in this research study.

Care must be taken when designing a semi-structured interview to phrase questions so as to ensure that the respondents can say what they want to 'rather than promoting the researcher's agenda' (Cohen et al., 2000 p. 246). The researcher must make every effort to avoid bias and ensure the reliability of data (Morrison 1996).

The questions for interviews were generally formed to be open-ended supported with some elements to encourage and guide interviewees to enrich their responses. Copies of the interviews used in this study are attached in the appendix IX.

There were general aspects included in all interviews. These aspects are: information about interviewees such as their, job title, gender, qualifications, age, nationality etc.

The interviews with the teachers and children were guided by a set of specific questions. The questions used in the interviews were refined and shaped by the pilot study. In this study, semi-structured interviews included a:

- 40- 45 minute interview with each teacher;
- 20-25 minute interview with each of the children who were involved in the computer centre.
- 20-25 minute interview with selected children who were not involved in the computer centre.

Interviews took place after the observations phase with the teachers nominating convenient times and places. All interviews were conducted at the school sites and participants granted permission for the interviews to be recorded for the purpose of transcription. Interviews were recorded using semi-professional digital audio equipment suitable for data collection. Transcripts were made of teacher interviews and returned for verification. It was not appropriate to involve the children in this process; however, two children requested to hear what they "sound like" and this opportunity was provided. Whilst Stake (1995) believes tape recordings are inferior to field notes, the researcher followed the advice of Merriam (1998) who advocates their use because "verbatim transcription of recorded interviews provide the best database for analysis" (p.88). The researcher was mindful of Bogdan and Biklen's (1992) point about the transcription time, therefore interviews ranged between 15 to 45 minutes, and focused on semi-structured questions. As the researcher was interested in their spontaneous thinking and views, the questions were not provided in advance to the participants.

5.7.2.3. The Teacher's Semi-structured Interview

The aim in this interview is illustrated by the following main questions. This is the information that the researcher wished to ascertain:

- What do pre-school teachers think about computers in pre-school settings?
- Which forces exist in working with the computer and play in pre-schools according to pre-school teachers?
- How do pre-school teachers think the computer influences activity in the pre-school?
- What is the atmosphere like when children are sitting in front of the computer?

When computers are being used in pre-school settings, critical questions must be addressed including: do pre-school teachers feel it is necessary for children of pre-school age to use a computer and the boundaries and barriers that exist when working with computers as a tool for play in a pre-school setting.

All interviews took place at the office of the subject and lasted between 40-50 minutes. It is also important for the researcher to appear naïve during the interview about the topic as outlined in the guided questions. This, according to Yin (2003:91), allows the respondent 'to provide a fresh commentary about the topic, otherwise, the "corroboratory purpose" of the interview will not be served'. Where appropriate, new questions raised from previous interviews are also repeated to other respondents, in order for the researcher to determine understanding of certain aspects or issues that exist. In addition, according to Yin (2003), it is important for the questions to follow the sequence of the interview, or conservation in order to know 'why' a particular process (subject that has been studied) occurred as it did. Thus, further questions or follow-up questions were also developed during the interviews when needed. This sustained the dialogue, which is interesting for understanding of the whole topic that is discussed, and provoked further answers to the relevant issues.

As addressed by several authors, this approach is important for the researcher for two reasons. The first is to give more 'flexibility' in probing and to explore certain subjects in greater depth, and thus, allow inclusion of new areas or dimensions of inquiry that were not originally included or established by the researcher (Patton, 1980, 2002). According to Miles and Huberman (1994), this 'flexibility' gives further confidence that we really understand what has been going on, with attempts to ask more. The second is to allow the researcher to test the sequence of events by deliberately checking with persons known to hold different perspective or information (Yin, 2003). Both of these views are considered as strengths and advantages for qualitative approaches by using the interview method.

Nevertheless, there were several concerns before the fieldwork began in relation to factors of time constraint and confidentiality. However, the researcher had the advantage of being introduced by other respondents, and most of the respondents did not set any time frame for most of the interviews. This allowed friendly conversation, which reduced the risks that the interviewee might give only what the interviewer wants to hear (Yin, 2003), or try to be a good subject by only giving good stories from their side (Rosnow & Rosenthal, 1997). Gillham (2000a: 31) also highlights that the data should be representative of not only 'what people tell you about, but what they avoid telling you about'. In terms of data confidentiality, the researcher had to assure respondents that information would be used for academic purposes only. This was important to establish, as the researcher attempted to record the interviews in the knowledge that recording might affect their answers. Thus, the researcher asked permission to tape the interview, in order to build this trust. As a result, the respondents responded very well to sensitive topics or issues during interviews. In many cases, the respondents appeared to forget that they were being recorded because of friendly interaction, although they were assured that the tape would be switched off at their request at any point in the interview if required.

Seven respondents did not have any problems in allowing their interviews to be recorded on tape. Only one respondent refused to be recorded on tape, and therefore, interview notes were taken during interview. The large number of respondents that were willing to be recorded on tape allowed the researcher to analyse the interviews in detail afterwards. Tape-recording makes it easier for the researcher to provide an accurate and convenient record of the interview and assists analysis of the data, and therefore an invaluable source of evidence (Oppenheim, 1992). Similarly, several other advantages of using tape-recording, as indicated by Easterby-Smith *et al.* (1991, 2002) applied in this research, such as:

i. It aids the listening process and gives the opportunity of an unbiased record of the conversation.
ii. Good audio recordings are essential for accurate transcripts and also enable the researcher to re-listen to the interview, so he or she may well hear things that were missed at the time.

All respondents (Teachers) were guaranteed anonymity, and offered the option to reflect upon the conversations and to raise concerns and add further thoughts or amendments if they so desired (Cohen et al.,2000).

5.7.2.4. Interviewing young children

Cristensen and James (2000) note a paradigm shift: whereas children in the past were the object of research, today's children are often the participants (2000 p.3). Cristensen and James (2000) suggest that special methods are not necessary for research with children, meaning that children can take part in structured and unstructured interviews and complete questionnaires (2000 p2). When conducting interviews with children, the interviews need to be extremely short and focused, partly because some have shorter attention spans but also because methods need to be familiar to the children and thus make 'human sense' to them.

For the purpose of the study, the children who never play at the computer centre during the twenty days observation period (identified in stage two) and the children who were involved in stage three were interviewed. They were informally interviewed at the end of the study to understand better their feelings about using the computer.

5.7.2.5. Child Interview questionnaire

When doing the interviews with the children, I needed to be careful about the wording of questions. When interviewing students, Holmes (1998) advises, 'the key is to avoid misleading questions or getting the children to say what you want to hear'(1998 p.23). Holmes (1998) also suggests tailoring the questions to the children's language ability, which can vary greatly. It is also worth remembering when interviewing children that some children will say anything rather than nothing at all, thereby limiting the possible reliability of the data (Simon, 1982 and Lewis, 1992).

As described earlier, I recorded the conversations on tape. The tape recorder is useful for playing each short segment back to the interviewer which heightened my awareness. Besides that, from my preliminary interviews I found that the tape recorder was a great help to my subsequent understanding of and sensitivity to differences of tone of voice and emphasis. In addition to the interview with the children I kept a journal of my work with them. The journal entries helped me to draw together the information I had about each child's opinion about computer use and the methodology of the study as a whole.

All the interviews with children were conducted in the resources rooms. During the interviews, one interview protocol sheet was prepared for each participant and placed in front of the interviewer. As the participants responded to the questions, the interviewer wrote down the answers on the participants' interview protocol sheet.

All interviews were conducted in the Malay language. Since interviewing is a social encounter, respondents tend to respond in a socially acceptable or socially desirable way (Wiersma, 1986, p.18). Accordingly, the children in this study responded in the most socially acceptable language. For the children in this study, this was the Malay dialect. The researcher could not neglect this dialect as in the actual classroom setting; the Malay dialect is acceptable for conversation. All the interviews were completed during the last week of the observation period in the classroom.

5.7.2.6. Limitations of interviews

Patton (1990) believes that the emotional state of the interviewee at the time of interview could affect the interview data. During the interviews, gathering high quality information is often affected by respondents who are uncooperative, paranoid, sensitive, easily embarrassed, aggressive, timid and hostile (Patton, 1990). According to Patton (1990), misrepresentation and distortion of interview data may result from personal bias, anger, anxiety, politics and simple lack of awareness. In order to minimise the potential limitations of the interview in this study, the researcher gave considerable attention to establishing rapport with the children being interviewed (Patton, 1990). Rapport was enhanced by having a short informal conversation prior to the more formal interviews. The researcher asked the children about anything that might interest them, for example, TV programmes or interesting places that they might have visited. The children were made as comfortable and relaxed as possible. They were also reassured that they were not being tested. To reduce variations in data potentially created by having many interviewers, (Patton, 1990), the researcher in this study conducted all of the interviewing herself in Malay. In addition, the responses were transcribed and coded only by the researcher in order to reduce the degree of translation error caused by other people who did not conduct the original interviews and were not privy to the subtlety of the conversations.

5.7.2.7. Piloting the Interviews

All the interview questions were translated into Malay language, before being piloted. One Malaysian language specialist was requested to revise the interviews. This was followed with some changes in both the Malay and the English versions because the translation required a slight adjustment to be consistent with the new Malay language structure.

The pilot study for the interviews was carried out with two pre-school teachers. The purpose of doing so was to ensure that the instrument was accurate and could achieve what was intended. The pilot study was also to identify potential practical problems in following the research procedure. Hence this stage offers valuable feedback to a researcher. The researcher benefitted from the pilot study, especially from the comments of the teacher. From testing the interview questions I realised that there were a few questions requiring clarification to suit the interviewees understanding, and there was a need to add a few questions to cover some other important issues which had been omitted. The pilot study also provided the researcher with an opportunity to identify weaknesses in her interviewing techniques before proceeding with the proper interviews. Such weaknesses were:

- the necessity to insert probes to develop participant responses;
- the need to follow up interesting leads;
- the importance of establishing the most appropriate position of the tape recorder; and
- the habit of moving on too quickly to the next question.

5.7.3. Documents

A final source of data in this study were documents collected from the cases. According to Creswell (2002), documents, consisting of public and private records, newspapers, proposals, journals and letters can provide useful information helping researchers understand central phenomena examined in a qualitative study. Whilst accepting that documents are often fragmented, incomplete and sometimes difficult to obtain, Merriam (1998) suggests that they are useful sources for qualitative case studies because "they can ground an investigation in the context of the problem being investigated" (p.126). Thus, in this study the researcher obtained the pre-school curricula documents and teacher lesson plans during the study. These were analysed to reveal how teachers use the computers in the classroom. Besides that the school's brochures and computer logs were also collected as documents.

5.7.4. Physical artifacts

Physical artifacts collected during each case study included the resources created by children and work samples from children, pictures of the classrooms and pictures of children using the computers. Table 5.7-1 presented the summaries of data sources.

Table 5.7.1: Summary of Data sources

	Classroom
Observation	-The classroom setting was the environment within which the observations took place, including computers, other play centres, and aspects of classroom's physical layout. -Children's behaviour included their interactions with the computers, their peers and their teachers. -Teacher behaviour included the teacher's interactions with children in the computer area. These interactions included verbal and physical behaviour relating to the children or the computer.
Interviews	Mini interviews with teachers, principals and children.
Documents	Pre-school curricula document teacher lesson plans during the study, school's brochures and computer logs
Physical artefacts	Work samples from children, pictures of the classrooms and pictures of children using the computers.

In summary, the methodology used in this research, to study the effect of computer use on the social interaction behaviour of preschool children in four pre-schools in Malaysia, tried to look through "four pair of eyes". The eyes were the eyes of the children, the eyes of the teacher, the eyes of the principal and the researcher's own eyes, which allowed her to see the consistency across the "four pair of eyes".

5.8. Data collection procedure

In planning the schedule for the fieldwork, many things were taken into consideration. School term holidays and public holidays were checked before making trips to Malaysia. However, unavoidable circumstances resulted in the researcher having to cancel and reschedule some visits, for example children were absent from school and classes were cancelled because of official functions.

Before the fieldwork commenced, the researcher identified the pre-schools. The researcher then met with the respective principals and advised them about the purpose of the fieldwork and requested permission to enter the pre-school for this purpose. The researcher then sought permission from the Ministry of Education. Fieldwork started once the application from the Malaysian Ministry of Education and Glasgow University ethics committee were approved (Appendix X).

5.9. Analysing the Data

The data analysis for the case study is described as a process of making a detailed description of the case and its setting (Creswell, 1998; Huberman & Miles, 1998; Merriam, 1998; Yin, 1994). According to Patton (2002:432), qualitative analysis transforms data into findings, although 'no formula exists for that transformation', but rather guidance so that the final process of analysis 'remains unique for each inquirer, known only when – and if – arrived at'. In this case, he further notes that guidelines, procedural suggestions and exemplars are not rules, so that applying them requires the researcher's judgment and creativity. Creswell (1998:140) points out a similar argument in that 'undoubtedly, no consensus exists for the analysis of the forms of qualitative data'. The fundamental idea in the process is to make sense out of the data.

Nevertheless, authors such as Miles and Huberman (1994:10-11) attempt to describe general views of qualitative analysis as consisting of three concurrent flows of activity. The first is 'data reduction', which refers to the process of selecting, focusing, simplifying, abstracting and transforming the data that appears whether in the form of transcriptions or field notes. The second is 'data display' as an organised, compressed assembly of information that helps us to understand what is happening and to do something – analyse or take action – based on that understanding. The third is 'conclusion drawing and verification', by which the researcher begins to decide what things mean and, therefore, note regularities, patterns, explanations, possible configurations, causal flows and propositions. According to Hampton (1999:294-299), the process of qualitative analysis in practice can be simplified into four main stages, which are familiarisation and discovery, coding and display, ordering and displaying, and developing interpretations and verification. All stages described by these authors share similar conceptual processes that are widely used in qualitative data analysis.

In relation to this, Walsh (2003:71) has noted that the goal of qualitative data analysis is 'identifying related themes and patterns, to discover relationships among the themes and patterns, and to develop explanations for these relationships'. This can also be referred to as thematic analysis, as one of the key processes in organising qualitative research data. According to Boyatzis (1998:4), thematic analysis is 'a process to be used with qualitative information' and 'a process for encoding qualitative information', in which 'the encoding requires an explicit code'. In this context, he notes that a theme is a pattern found in the information that at minimum describes and organises the possible observations, and at maximum interprets aspects of phenomena. Boyatzis (1998:7-8) further suggests that the effectiveness of thematic analysis is based on several key factors, which are:

i. Pattern recognition as the ability to see patterns in seemingly random information.
ii. Openness and flexibility as an advantage for the researcher to perceive the patterns.
iii. Planning and systems thinking that enables a person to organise the observation into a usable system.

According to Stake (2000:448), one of the major conceptual responsibilities of the qualitative case researcher is 'selecting phenomenon, themes, issues – that is, the research questions – to emphasise'. Thus, this research adopted thematic analysis as a way to draw conclusions from the data in order to answer the research questions. Therefore, prior to the analysis stage, the researcher transcribed all recorded interactions and interviews from all of the respondents (46 children and 8 teachers and

2 principals). According to Poland (2002:629), the transcription of audio taped interviews is 'a method for making data available in textual form for subsequent coding and analysis', which is widely used in qualitative research. The process took the researcher approximately three months from July to September 2005 (for case study 1 and approximately two month Jun-July 2006 for case study 2, 3, and 4). This involved intensive work with the help of a transcription machine. The effort to complete all transcription clearly provided advantages for the researcher during the analysis process. The first stage of thematic analysis required the researcher to undertake repeated review or reading of the children's dialogue and interview transcriptions. This was done in order to identify conceptual themes or patterns emerging as a platform of argument or discussion. Thus, a careful and line-by-line reading took place, with the aim that the process will be able to recognise and provide early insight for potentially emerging themes. At the same time, this also helped the researcher in developing a coding scheme manually. The objective was to capture the essences of the discussion and then organise them into concepts. The naming of codes was only undertaken when the data began to suggest possible labels. As noted by Boyatzis (1998:11), the process of thematic analysis requires the researcher to 'develop a code to process and analyse or capture the essence of observations'.

At this stage, the researcher relied on open coding through the analysis of the initial children's dialogue and interview transcriptions. According to Strauss and Corbin (1998:101), open coding is 'the analytic process through which concepts are identified and their properties and dimensions are discovered in data'. They further note that this is an essential step to begin with, or otherwise, the rest of the analysis will face difficulties. During open coding, the researcher began to break down the data into discrete parts, closely examined them, and started to compare them to find similarities and differences. Thus, once the process continued to other social interaction and interview transcriptions, the strategy, based on open coding, shifted to comparison of new data elements, or new conceptual themes. In this case, the previously coded themes developed along with the reading of the new data or transcription of other respondents. This allowed the researcher to cluster the coded themes into categories that share similar or distinctive conceptual themes. As noted by Creswell (2003:203), "the researcher, during qualitative data analysis, should organise the data 'categorically and chronologically, reviewed repeatedly, and continually coded". The process can also be described as back-and-forth analysis that attempts consistently to compare and develop patterns that exist in the data or the transcription. Miles and Huberman (1994:91) refer to this process as analytic progression, whereby researchers 'begin with a text, trying out categories on it, then moving to identify themes and trends, and then to testing hunches and findings, aiming first to delineate the "deep structure" and then to integrate the data into an explanatory framework'.

In general terms, during this process, several combination tactics as described by Miles and Huberman (1994) were applied. These were:

i. Noting pattern/themes, seeing plausibility and clustering, in order to help the researcher to see 'what goes with what'.
ii. Making metaphors, as a way to achieve more integration among diverse pieces of data.
iii. Making contrasts/comparisons, as pervasive tactics that sharpen understanding for distinctive elements in the data.

Boyatzis (1998:11) notes that the process should be able to 'interpret the information and themes in the context of a theory or conceptual framework – that is, contributing to the development of knowledge'. As a result, themes or sub themes that are able to provide understanding for the aspect that becomes a major concern to the aim of the research are identified. In this research, these emerging themes were clustered or categorised into seven main headings. Once these themes were determined, the process was continued to interpret and draw meaning from the displayed data. During this process, quotations from the respondents (Children's talk) and interview transcripts were used to represent the findings. According to Coolican (1999:463), to include quotations from the respondents 'will bring the reader into the reality of the situation studied' and thus, be able to 'tell it like it is'. Nonetheless, there are two issues that are important to note. Firstly, most of the data was in the Malay language (twelve respondents), while nine respondents employed a mixed use of English and Malay. Therefore, the 'meanings' of the findings required the translation into proper English language. The translation by the researcher was verified by two other Malay-speaking PhD students at Glasgow University who were dealing with similar processes of translation during their data analysis. This was undertaken in order to cross check the consistency in the translations with accurate interpretation. The verification with two other Malay speakers was also undertaken to avoid bias where the researcher might project his or her own views into the translation and interpretation of the quotes.

Secondly, the researcher preferred not to use a professional translator in translating the whole transcriptions in order to preserve the 'meanings' of the text from breaking down before the thematic analysis began. In this case, the researcher undertook the translation herself with the help of two other Malay speakers. This is important, as the use of words and context during the real situation in the interview could only be fully understood by the researcher and interviewees or respondents. Both of these issues were addressed in order to sustain the reliability and validity of the data in this research.

In addition, reasons behind the decision to analyse the data manually rather than using computer software are similar to the above. This was to reduce the risk that analysis by using computer software would not be able to locate and to take into account important situational and contextual factors. Creswell (1998:156) highlights that computer software 'should not be a substitute for close reading of the material to obtain sense of the whole'. Easterby-Smith (1991:113) argues that 'there is no package that can substitute for the interpretative skills of the researcher, in which the identification of significant themes, patterns and categories still has to be done by the researcher'. In relation to this, there was the concern that the results would most likely be seen as a quantitative analysis of qualitative data, rather than the results of qualitative data analysis. Besides, the process of using computer software requires following several technical steps or procedures, with less possibility for the researcher to adopt 'spontaneous' sensible decisions or flexibility in making her own judgments where necessary.

However, it is also important to note that the choice of manual analysis was strongly preferable because of the nature of the qualitative data in this research. Therefore, the researcher had difficulty in identifying computer software or programmes available in the market that were really suitable for the task required. As noted by Creswell (1998:155), 'not all qualitative researchers see such programmes as relevant to their needs'. This is without denying the advantage of computer software, which can help to reduce time, especially with the analysis of a large text database (e.g. 500 or more pages)(Creswell, 1998), and when the researcher is clearly able to choose the appropriate programmes for the level of sophistication and the sort of analysis that is required (Miles & Huberman, 1994). In this case, manual analysis was the most comfortable approach for the researcher since there are no specific forms of database prepared for use by computer methods to analyse the content of the data before the fieldwork begins. Therefore, the choice of manual compared to computer methods of content analysis is a general sense of style and approach that is believed and expected to be appropriate for the researcher to 'work around' or to have better control of the data during the analysis.

The study's findings are based on the analysis of data. Stake (1995) asserts "there is no particular moment when data analysis begins" (p.71). Analysis involves giving meaning to first impressions and final compilations, in essence taking apart the information collected through reading and re-reading accounts followed by deep thinking. To Stake (1995) it is the pulling apart of instances and putting them back together in a more meaningful way that allows the findings to emerge. The interpretations of the findings are underpinned by the "emergence of meaning from repetition of the phenomena" (p.76), and the emergence of meaning within individual instances in the form of quotations taken from the transcripts of interviews, and from field notes.

5.10. Writing the Report

Merriam (1998) states that writing a case study may require a greater proportion of description than other forms of qualitative research in order to convey a holistic understanding of the case. Throughout the writing of this case study, attempts were made to draw a holistic picture of the classroom computer use by providing detailed descriptions.

For this purpose, the writing process began with the initial introduction of each case to the readers, which was followed by detailed descriptions. Denzin (1998) suggested three qualitative writing styles: mainstream, interpretive and descriptive. In the first two styles writers include personal interpretation while presenting the themes. On the other hand, "in descriptive realism the writer attempts to stay out of the way and to allow the world being described to speak for itself" (Denzin, 1998, p. 327). In this study the descriptive realism style was used to describe cases, as they presented themselves; personal interpretations were left for the discussion part of the dissertation.

5.11. Research rigour

Rigour is the hallmark of trustworthiness. Without rigour, research cannot be recognised. Therefore ensuring rigour for qualitative research was considered not only to be necessary, but also to enhance the research itself. Several researchers explain that each paradigm poses its own specific criteria for rigour (Guba & Lincoln, 1989; Lincoln & Guba, 1985; Patton 1987). In the following paragraphs, the criteria for judging this research are explained.

5.11.1. Validation of data.

There are two essential factors that must be taken into account in any credible research: how reliable the data is, the extent to which measures give consistent results:- and its validity – the extent to which they correspond to the true position of the person or object or the characteristic being measured (Selltis 1976, p.160).

The research findings were supported not only through observations but by using semi-structured interview and documents.

There are, of course, limits to any research. The limitations of this study were in the number of centres used, the time available for observations and the fact that the research was conducted in a single city, Tanjong Malim, Malaysia. However, the research programme was conducted within the accepted parameters of case study methodology and was therefore valid. Validity is the most important aspect in educational research. However, reliability also has to be considered. This is now is discussed in the following section.

5.11.2. Trustworthiness

Lincoln and Guba (1985) proposed "trustworthiness" as the parallel term of 'rigour' for the qualitative paradigm. Likewise, the terminologies of reliability and validity from the qualitative paradigm have been replaced by credibility, transferability, dependability and conformability in the qualitative paradigm (Lincoln & Guba, 1985).

5.11.3. Credibility

Guba & Lincoln (1989) suggested that internal validity in the rigour is parallel to the standard of credibility in trustworthiness. Guba & Lincoln (1989) and Merriam (1998) recommended several techniques for enhancing credibility. The credibility of this study was enhanced by emphasising rapport between the researcher and the participants including teachers and children. This was initiated through prolonged engagement (Guba & Lincoln, 1989) at the first pre-school and using data collection techniques, like note taking that are less threatening in the classroom.

Merriam (1998) and Guba & Lincoln (1989) suggest that sharing the information and findings with peers can contribute to the credibility of the research. In this study, colleagues from the same research area were often engaged in discussions of the new findings. Besides that, the design and implementation of the interview protocols was initially an iterative process that involved several pre-school education colleagues, trials with teachers and children and thus improved (Guba & Lincoln, 1989).

To clarify and verify the repeatability of an observation or interpretation, this study employed triangulation at several levels (Merriam, 1998; Stake, 1998). Patton (1990) describes four levels of triangulation; methods triangulation, triangulation of sources, analyst triangulation and theory and perspective triangulation. Creswell (1998) recommends triangulation and member checking techniques for evaluating the trustworthiness of the case study. In order to construct a valid and credible study, trustworthiness was attempted through the techniques of triangulation, member checking and peer examination.

Triangulation was defined as making sure to use multiple and different sources, methods, researchers, and theories to provide compelling evidence (Creswell, 1998;

Merriam, 1998). Within this study, different data collection methods were used such as interviews, observations, audio-visual materials and documents. Moreover, the data colleted from teachers and children served triangulation efforts as multiple sources.

Member checking meant that the participants of the research were asked to review the findings of the study (Merriam, 1998; Creswell, 1998). As stakeholders, the teachers and principals were given transcripts of their interviews to confirm the accuracy of the content, to provide them with opportunities to revise statements, and to allow them to give additional information if desired. For the purpose, the participant teachers were asked to examine rough drafts of this study in order to verify findings.

Peer examination also called peer review or debriefing included asking a colleague to comment on the findings as they emerge. Formal debriefing by committee members and professional peers at postgraduate seminars provided opportunities for the researcher's methodology and preliminary findings to be evaluated. The comments and questions were critical in shaping the emergent design.

5.11.4. Transferability

Transferability was proposed as a parallel to external validity for the qualitative paradigm (Guna & Lincoln, 1989). However, while generalisation is based on the conditions for randomised sampling, transferability refers to the process of "checking the degree of similarity between sending and receiving contexts" (Guba & Lincoln, 1989, p.241). The transferability criterion is satisfied, according to Lincoln and Guba (1985), by "thick description" (p.328). Merriam (1998) defines thick description as "the complete, literal description of the incident or entity being investigated" (p.29-30). By providing a thick description of a particular situation, the events and situations are thus allowed to speak for themselves (Cohen et al., 2000) and the reader can make decisions about the degree to which the findings can be transferred to another context. Transferability in this study was strengthened by using a series of phases and providing rich qualitative data.

5.11.5. Dependability and conformability

Is the data stable over time? Guba and Lincoln (1989) suggest that instability may occur "because inquirers are bored, are exhausted, or are under considerable psychological stress from the intensity of the process" (p.242). This however, does not include changes that occur as a result of methods reconstruction (Guba and Lincoln, 1989). In this regard, dependability of this study was enhanced by having only one researcher collect the data. This ensured that the data collector was critically aware of the purpose and importance of the data throughout the data collection process. The researcher believes that the study was carried out with reasonable care and that the process of the study was consistent with the methodology described

5.11.6. Ethical issues

While ethics is a topic discussed in educational research, few discussions specifically focus on the ethics of social research with children. Alderson (1995) and Morrow and Martin (1996) are examples of the few who do.

In any form of research it is important to consider ethical guidelines or protocols. My study involved human beings directly so I need to pay close attention to the process of data collection, analysis and dissemination. Even though the data collected for this study were not politically, socially or physically sensitive in nature, ethical issues were considered important as Stake (1998) suggest that "their (qualitative researchers) manners should be good and their code of ethics strict" (p.103). An important aspect of the data collection process was the researcher-participant relationship during the classroom observation and interviewing. The nature of the cultural context of Malaysia, however, meant that the researcher was limited in the form of relationships that she could develop with the participants. Therefore, the most important ethical issues related to the study concerned the teachers, the school children and the school where the investigations were conducted. The ethical issues taken into consideration during the development of this research study were informed consent, access and acceptance, anonymity and confidentially (Cohen et al., 2000).

5.11.6.1. Access and acceptance

Cohen et al (2000) assert that "Researchers cannot expect access to a nursery, school, college, or factory as a matter of right".

As was explained earlier, this study was conducted in four pre-schools in Malaysia. Throughout the study, there was a common system for gaining permission to undertake each stage of the research. The first step was the obtaining of approval from Glasgow University Ethics Review Committee (Human subject). (Appendix X). The second step was the gaining of permission from the relevant school systems and approaching the potential participating pre-school. The third step was the gaining of the approval and support of the relevant school principals to undertake the research in their pre-schools. In establishing rapport, the researcher also spoke to the teachers who would be participating in the investigation. This was followed by requesting permission formally, in writing, through the official channels. A letter was sent to the Ministry of Education, in particular the Pre-school Education Section, explaining in detail the purpose of the study and the data collection methods to be used as a part of the process of gaining this approval and support, the researcher agreed to provide general feedback and a copy of the written report to the selected pre-schools. (See appendix X)

As soon as the permission was obtained, a series of visits were made to the pre-schools during which arrangements were made with the teachers whose children and classes were to be involved in the observations and interviews. Permission also was sought from the respective teachers in each pre-school to use appropriate rooms to conduct the interviews.

5.11.6.2. Parent Consents forms

Burns (2000) asserts that the principle of informed consent is the most important ethical agenda in doing research. It involves the right to participate and the right to refuse to take part (Cohen et.al (2000). Potential participants should sign an informed consent form which described the purpose of the research and the right to withdraw.

Parents volunteered themselves and their children as participants mainly as a result of the letter handed to them (Appendix X) and their knowledge of staff and centre management support for the study. The author made no contact with parents, and no parent made contact with the author prior to the start of the observations. No demographics, family background or other personal information about their child was solicited from parents.

For the purpose of the study, I obtained parental consent by sending the informed consent letter to children's parents. "Informed consent means the knowing consent of an individual to participate as an exercise of their choice, free from any element of fraud, deceit, duress, or similar unfair inducement or manipulation."(Berg, 1998:47)

Once permission was gained to work in particular pre-schools, the initial contact with parents was through a package sent home with all children in the pre-school. The package contained three documents a letter of introduction, information about the study and a consent form. These documents in the parents' package were in Malay language.

In the accompanying letter, I mentioned the confidentiality. I was very aware that privacy would be paramount. A clearly worded letter would need to be sent along with the parental consent form to ensure that parents were clear that all the data would be wholly confidential. Cohen et. al. (2000) identify the functions of a respondent's involvement, such as importance of obtaining their informed consent, their right to withdraw at any stage and the offering of guarantees such as confidentiality and non-traceability within the research.

Respecting every research participant as an individual was also an important moral issue. It is necessary to take into consideration any personal worries, nervousness and show each person due respect. They should not leave the experience with any sense of failure or loss of self-esteem (Cohen et al., 2000).

Prior to data collection, all the teachers and children were fully informed about the purpose of the research. This occurred verbally at the start of each observation and interview session where teachers and children were involved. They were given adequate warning that the researcher was coming to the class on a particular schedule.

It also was emphasised to the children that no marks would be given for their interview answers and that the interviews were not a test. In each case children were reminded that they could choose not to take part, withdraw from the study at any time and/or choose not to answer any questions about which they felt uncomfortable. The children and the teachers also were told that they were to participate without feeling coerced and were free to withdraw from participation at any time (Burns, 2000). It is worth noting that no child chose to withdraw from the study.

5.11.7. Anonymity and confidentially.

According to Cohen et al., anonymity ensures that information provided by participants does not reveal their identity. The personal data of the children and teachers in this study have been presented in an anonymous way. Confidentiality was considered important in this thesis because the disclosure of information about what was happening in the classroom might result in teachers' incompetence in teaching and learning being revealed. This could result in embarrassment. A number of techniques were included to ensure anonymity and confidentiality of the findings. The use of pseudonyms, instead of the participants' real names, means that people other than researcher cannot identify the participants from the information presented in the thesis. The location of the schools also was concealed. Finally, to reduce the possibility of losing confidentiality through the involvement of many interviewers and observers, (Patton, 1990) data in this study were collected only by the researcher.

5.12. Researcher's role

In this study I adopted a non-participant observer role. As a non-participant (Burns, 2000) the researcher did not participate in any activities or interactions that took place in the classroom. I observed and record all the events in the computer area. During or at the end of the observation sessions, I questioned the teacher about the computer activities. These mini interviews helped me to better understand the teachers' computer activities and practices. As a researcher my role also included conducting teacher and child interviews and collecting documents related to the computer activities.

Prior to the beginning of data collection, I had completed the research methods course. In that course, I was well informed about qualitative and quantitative methods in education research in general. I also have a personal interest in computer technology and its applications in education. I strongly believed that computers enhance children's learning and development when they are used appropriately. My interest in computers and their role in increasing the quality of early childhood education lead me to conduct this study. Additionally, computers have recently entered into early childhood education in my home country, Malaysia. I hope this research will help me become an expert in this area and better advise on the policies and procedures regarding computer integration.

During the observations and interviews, I forced myself not to interfere with the teacher's interactions and instructions with the computers. I stayed neutral and did not impose my own views about how computers should be used in the classrooms.

5.13. Summary and conclusion about the methodology

To facilitate the observation of pre-school computing activities on the pre-school environment, a setting for the study was selected on the basis of its stable environment. Full details of the purpose of the study and the data collection process were provided to individual staff members and each family with children who participated in the research. All staff agreed to participate in the study and all the parents agreed to their child being observed. Therefore, neither the setting nor the subjects could be considered random samples.

No experimental conditions were utilised in the current study. To maximise preservation of the naturalistic setting during the data collection period the observer adopted a non initiating relationship with the children in the playroom and in the computer centre. In addition, an orientation period was implemented prior to commencement of full-day observations of the children to provide all participants with an opportunity to familiarise themselves with the process of data collection. In particular, the orientation period was designed to help staff overcome any initial apprehension at being observed, and permitted the children to satisfy much of their curiosity about the presence of the observer and their role in the centre.

Furthermore, the involvement of teachers in this study was vital. Research techniques were selected that allowed the teachers to remain in control of what was going on in their classrooms and actively contribute to the research. Rich data was provided from each of the classrooms settings and when these cases were combined, a more complete picture of the diverse ways computers could effect the children's social interactions was obtained. The lack of existing research meant this research study is essential to inform the teachers. The case studies would, in turn, inform other teachers as they seek to introduce computers into their classroom.

Chapter 6: Findings from Case Study I

6.1. Introduction

This chapter commences discussion of the findings of the research, in the form of emerging themes derived from the observations and interviews. The first part of this chapter introduces a "Big picture" of the Child Care Centre, the classroom and the playroom at work, some background information about the context of the children and describes the setting of the case study in detail. Merriam (1998) asserts that because the major goal is to convey understanding, case studies must contain enough description for the reader. Through the detailed description of the selected setting, readers can vicariously experience their daily activities. These case descriptions are drawn from observational field notes, documents and interviews. This chapter will provide descriptive information about the classrooms, floor plan of the site, their staff, their curricular philosophy and will summarise one of the busiest days in these classrooms. Although four pre-school were involved in this doctoral study only the description and layout for pre-school A will be discussed in detail. The reason is that the layout for all pre-schools in Malaysia are quite similar. The differences for any classroom arrangement in the other pre-school will be discussed in chapter seven. The second part of this chapter, discusses the findings of the data analysis which were organised into six major themes (Section 6.3).

6.2. Part one-The site of the investigation

The child care centre selected for the current study is situated in a residential suburb not far from a school and small shopping precinct. The area is located approximately eighty kilometres from a large regional city, Kuala Lumpur. The local population is increasing, although many workers commute to the city or nearby towns. It is a government kindergarten and that enrols mostly Malay children from the middle income class. The school is enclosed by a fence. The door to the building is locked; visitors must ring a bell to gain admittance.

6.2.1. The Building

Set on a corner block of land, the single story elongated rectangular building has a fully fenced outside play area at the rear. Figure 6.2-1 shows the relative position and size of the building to outdoor play areas and surrounds.

The centre operates on a "long-day-care", basis, from 7.30 am until 12.30 pm for the morning session and from 12.30 pm-5.45 pm for the afternoon session each weekday, closing down briefly over the Public holiday and New Year period. It had originally been designed and constructed for the enrolment of 40 children per day. Later extensions have increased the number of licensed places for children to more than 80 per day organised into three groups: a nursery group for babies under 2 years and 2-4 year old "toddlers", and children aged 5-6 years nominated as "pre-schoolers". The age range of the children who were involved in this study (September 2005, at the end of the school year) was from 5 to 6 years.

Figure 6.2-1: Site plan of the child care centre

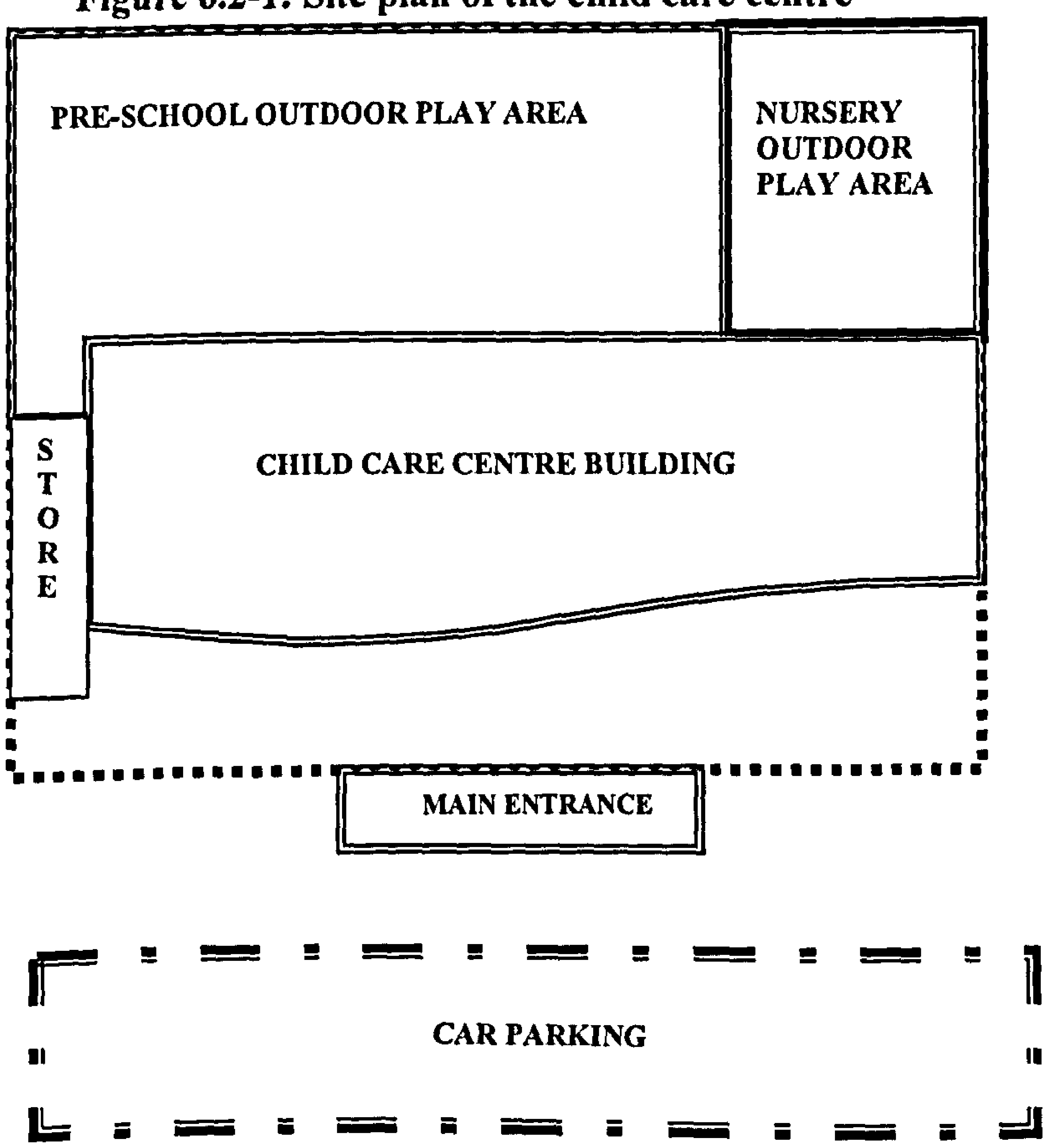
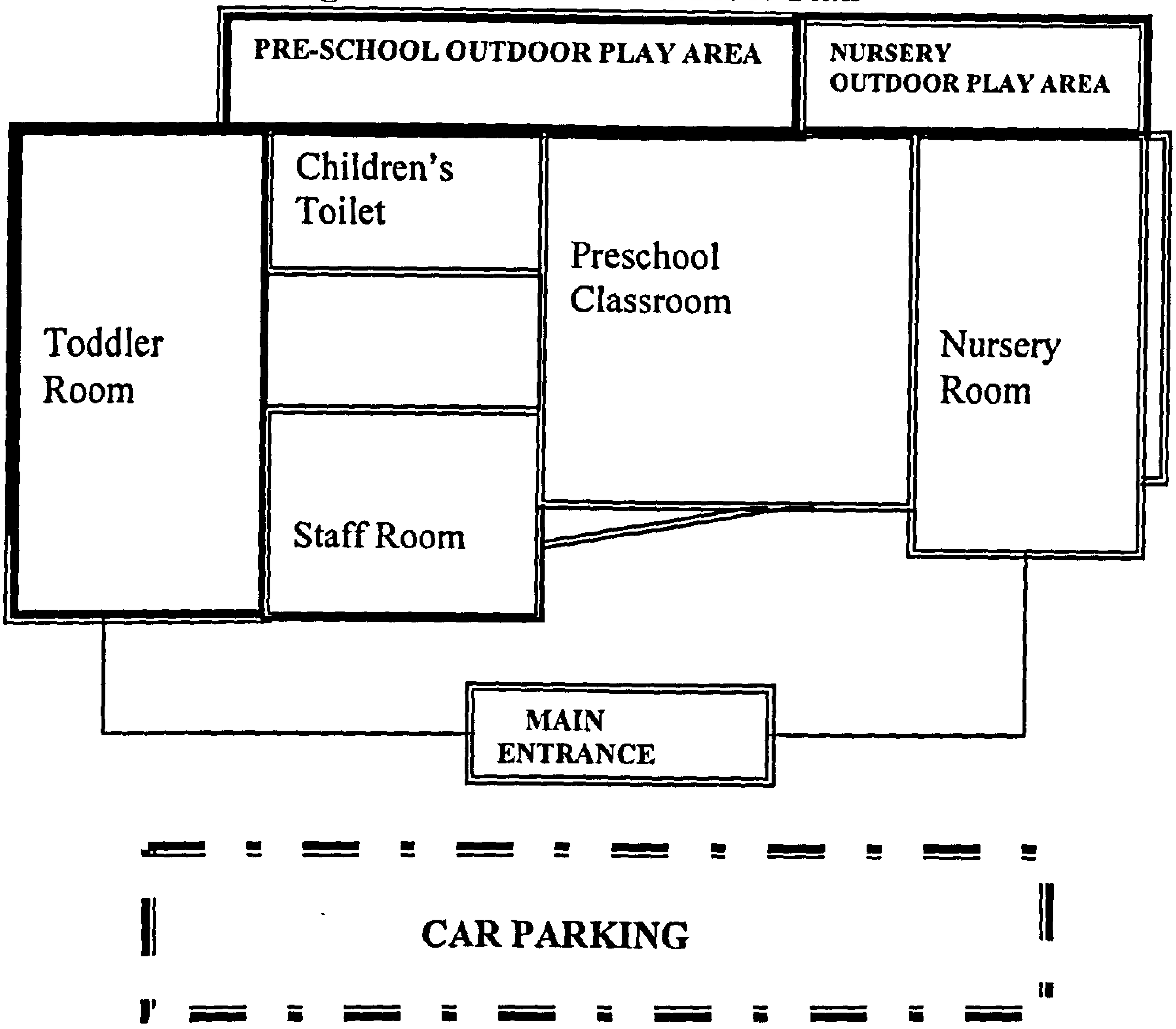


Figure 6.2-2 illustrates the floor plan of the centre and provides an approximate guide to the relative size and the location of rooms and play areas. The staff sitting room provides maximum opportunity for respite from the children during scheduled breakfast, lunch, and afternoon tea break. Although each classroom is self-contained with children's equipment and toilet facilities, there is easy access to all areas of the centre for adults. Besides that, unauthorised child access to specific areas or materials is minimised by child proof locks fitted on external doors and gates, as well as kitchen and laundry cupboards. Electric power points are equipped with safety switches and the only electrical equipment accessible to the children are computers, television and video-recorder when they are in use. The selected child care facility demonstrates good working practices to ensure that liquid spills are promptly mopped up and associated policies minimise other risks of accidents involving children.

Written programmes of activities together with goals and assessments are produced on a weekly basis. Records of children's development are maintained and special programmes are implemented within the centre when a need is identified. Day to day administration of the programmes for all children is the responsibility of the principal, who answers to the centre's management committee, which comprises parents, community members, and representatives of the city council. This centre receives government funding to help offset some operational costs.

Although operating under some financial constraint, the centre is well maintained and equipped, with sufficient materials to support a wide variety of activities for the children. Most of the equipment and materials used with the children is available from commercial suppliers. The programme of activities is recognisable as conforming to culturally and developmentally appropriate practices for the age group of children (Malaysia Pre-school Curriculum, 2002). Besides that, health, safety, care, and education policies are clearly stated and classroom rules are clearly and regularly verbalised to the children.

Figure 6.2-2: Child Care Floor Plan

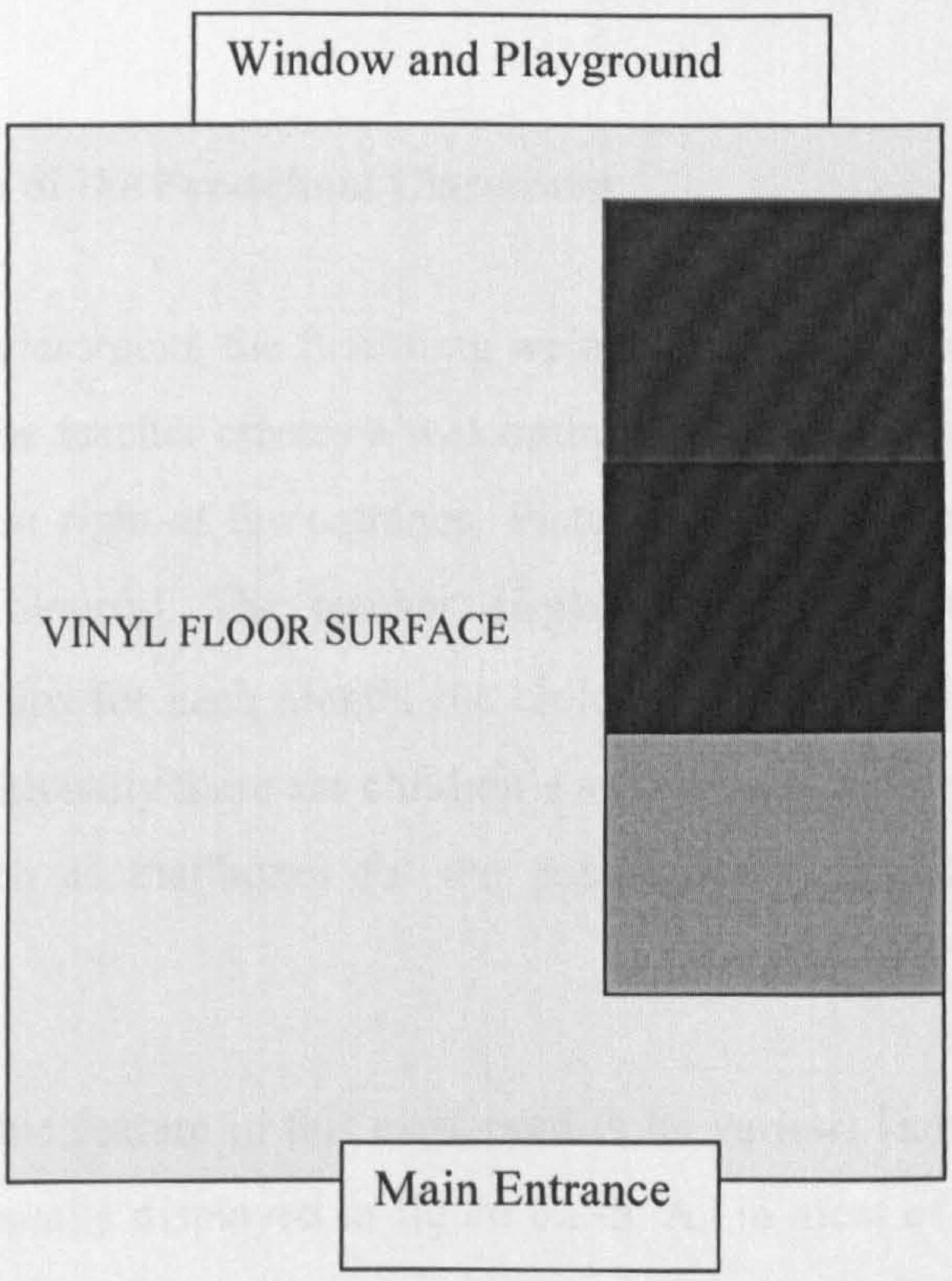


In addition to the programme of activities provided by staff trained in early childhood education, nursery staff members are trained in nursing and administer first-aid, medication and general health care to all children whenever necessary. The centre also employs a cook to prepare breakfast and lunch for the children each day.

The pre-school classroom, in which most of the indoor observations were made, is a large rectangular room with exposed roof supports, providing a high ceiling. Spaces along the beams are used for hanging mobiles and samples of the children's collage artwork. The beams as facilities for display augment the relatively small amount of yellow brick and cream painted plaster board wall area left by the large windows, open shelves, cupboards and doors.

A sketched floor plan of the pre-school classroom is illustrated in Figure 6.2-3. A little over half of the floor area has vinyl covering and is used for paint, chalk, play dough and other activities with potentially "messy" outcomes. At specific times the chairs and tables are rearranged on the vinyl floor covered section as a dining area for snacks and lunch. Approximately 45% of the floor area is carpeted in three sections. The area nearest the store is red, blue in the centre, and green opposite the entry gate. One carpeted section accommodates the book cupboard, two easy chairs and pillows, the second forms the "home" area, which is equipped with scaled down kitchen furniture, appliances and plastic utensils, in addition to "dressing-up" clothes. The third section is used as the block area, which also accommodates the puzzle table and puzzle storage shelves.

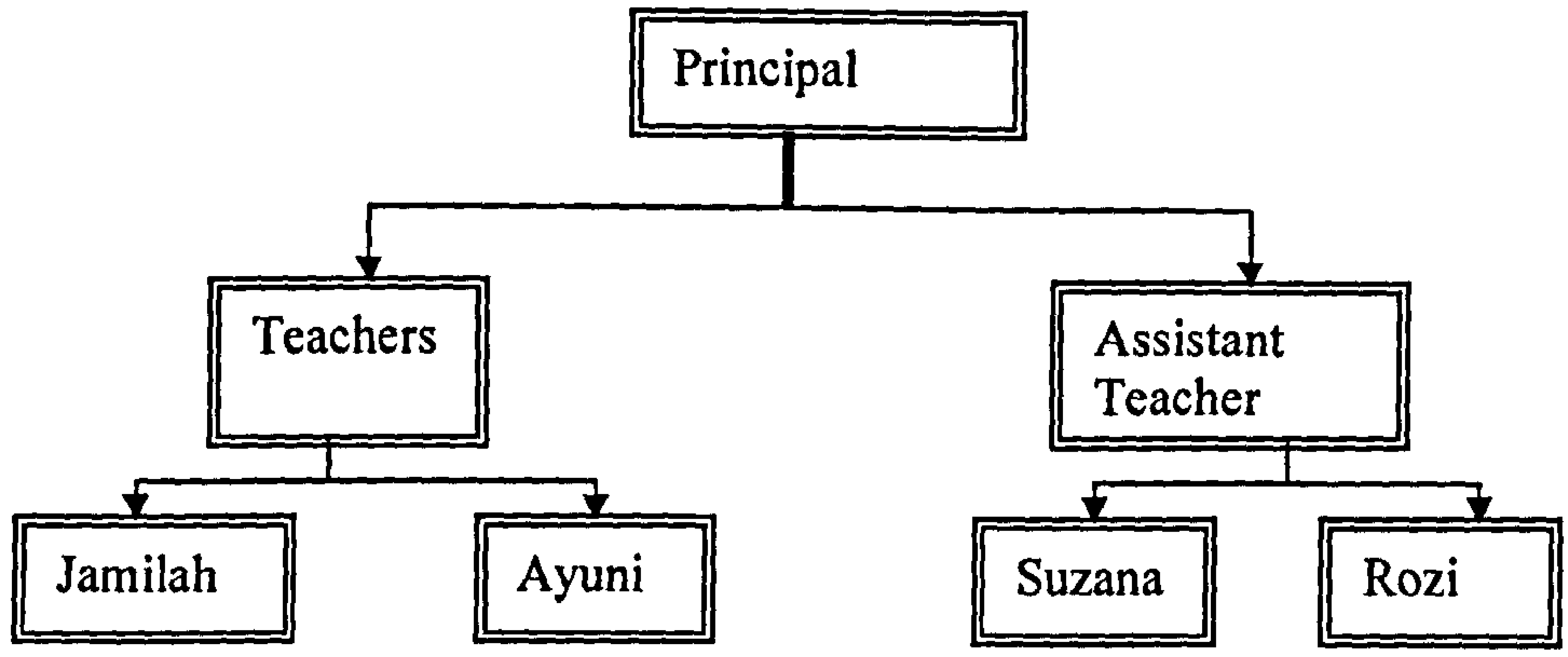
Figure 6.2-3: Floor Plan of the pre-school Classroom



6.2.1.1.The People

Pre-school A employed two full-time teachers, Jamilah and Ayuni who are from mid twenties to thirties in ages. The teachers had two full time teacher's assistants, Suzana and Rozi to help them out. More detailed information of the teachers and teacher's assistants are in appendix V. Figure 6.2-4 presents the pre-school A organisation chart

Figure 6.2-4: Pre-school A organisation chart

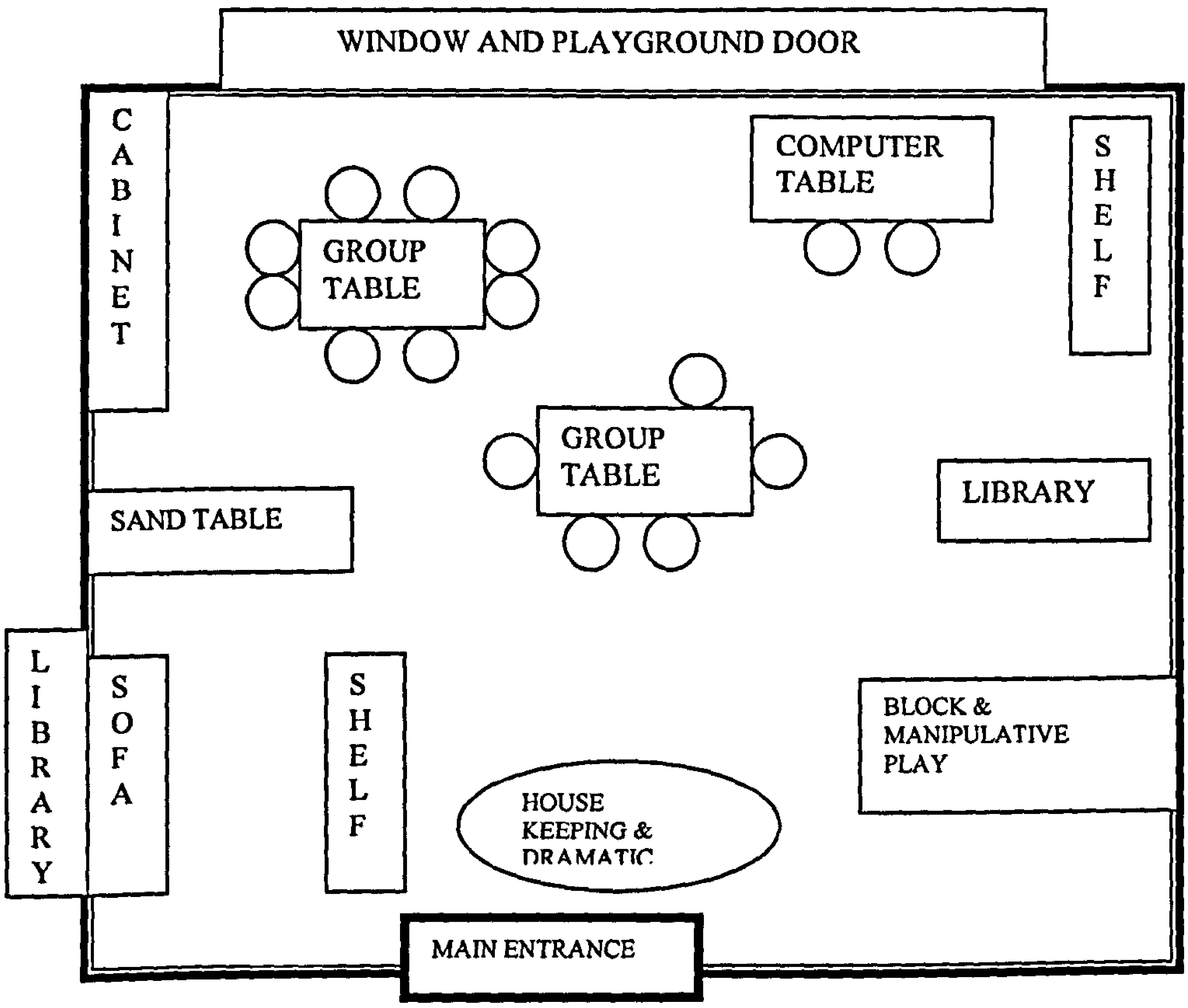


6.2.1.2. Description of the Pre-school Classroom

When entering this classroom, the first thing we notice is the brightness and liveliness of the classroom. The teacher creates a welcoming classroom environment by having a family sitting room right at the entrance. Pictures hanging on the walls make the room bright and colourful. The teacher displays children's artwork and printed materials such as signs for each month, the children's names and their birthdays all over the room. Additionally there are children's artwork and other items related to the daily activities, such as mailboxes for the post office theme, to make the room colourful and vivid.

The second noticeable feature in this classroom is its various learning/playing areas. The classroom is visually displayed in figure 6.2-5. As in most of the pre-schools, in this learning area, they have several activity centres (e.g., housekeeping, block, manipulative, writing, creative arts, and computers). All the centres are filled with lots of materials. All areas are spread out through the room, instead of distinctly separated by walls or shelves. For examples, the library is placed in two different sections of the room and both the housekeeping and dramatic play areas are combined. The block activity centres for example, consisted of designated floor areas surrounded by open shelving with natural maple unit blocks in which various block-play props can be introduced (toy cars/trucks, farm/zoo animals, etc.). The manipulative play activity centres consisted of several child-size tables/chairs with various types of materials such as puzzles, pattern shapes, Lego's, sorting materials, and so forth. The housekeeping centre in the classroom consisted of a small table/chairs surrounded by small kitchen play furniture (stove, sink, refrigerator, etc.), domestic props (dolls, play food, play dishes and pans, etc.), and a variety of adult-role dress-up clothing.). This classroom had no rules about how many children could be in a centre at the same time, but allowed fairly free access.

Figure 6.2-5: Pre-school A Classroom



In summary, the centre operates at a nationally recognised accredited level of quality with a stable programme structure, staff and management (Ministry of Education, 1993). These characteristics suggested that the environment would not be subject to extremes of variation on a day-to-day basis. As such, the site is suitable for the observation of the children's daily activities in the classroom.

6.2.1.3. Language

The selected pre-school uses three languages simultaneously. They use Malay as the medium of instruction. However, English and Arabic Language are given an early start so that the child becomes adept at handling 3 languages, Malay, English and Arabic.

6.2.1.4. School uniform

This pre-school required that all the children wear a uniform. Wearing the uniform, even in the pre-school setting, is more the norm than the exception in Malaysian education. Since the pre-school are either private or under government supervision, the uniform of each pre-school is distinctive to the school. In this pre-school the boys wore a light blue shirt, with short sleeves, which was worn loosely over loose dark blue trousers. The girls wore a light blue loose, long sleeved blouse over a pair of loose trousers. Most of the girls wear a *hijab* (headscarf) and they regularly took off the *hijab* during the free play time or messy activities. The dress code was not strictly enforced and if the child turned up for the day not wearing the uniform, he or she was not asked to go back home.

6.2.1.5. A day in the classroom (27/09/2005)

The pre-school schedule was a half day programme that ran from 8.15am to 12.15 pm. A typical day means a regular day where there was no preparation for a special event, such as training for the school sports day. Typically the students began arriving shortly before 8.00 am. This was usually because it coincided with the time the parents themselves went to work and they dropped their children off at the school en route. The school day itself began at 8.15 a.m. Table 6.2-1 presents the schedule for a regular day in the pre-school A.

a) Arrival (7.30- 8.15am)

The teacher in charge stood at the school gate to greet the children and the parents as the children arrived. The teacher greeted the child with "salaam" and "Selamat Pagi" (Good Morning). The child in turn, answered the teacher with the prescribed answers and also shook the teacher's right hand with his or her own right hand and kissed the teachers hand by giving it to his or her nose. The child then puts away his or her things in the school building. After being welcomed by the teacher, the children went to the play areas, such as housekeeping, dramatic play, library and computer, and engage in their play. The two teachers and other adults in the classroom constantly observed the children and become involved in their play as much as possible. However, during this time, most of the play was child initiated.

b) Assembly (8.15-8.30am)

The students were called in at 8.15 am for their daily assembly. The children who were playing outside put away their shoes in the shoe racks provided and entered the classroom in their bare feet, as did the teachers. The head teacher lead the assembly. The teacher started by calming down the children, asking them to take deep breaths and to give a big smile. She then greeted the children with the "salaam", to which the children responded appropriately. Then she asked how they were doing in English, to which the children answered "very well, alhamdulillah". This was followed by an exchange of greetings in the malay language.

c) Circle Time (8.30-9.00am)

In this pre-school, circle time refers to a structured opportunity to engage in the development of social skills including taking turns and listening to each other with respect. Sometimes, the teachers use the circle time to regroup the children after free play with ritual and routine. From my observations the teacher begins the circle time with a ritual to signal to the class community that a time of conversation, song and learning is ready to begin. The routine of circle time themes includes calendar (days, weeks and months), weather, name recognition, singing, and on specific days sharing of a special object (Field note). At the close of the circle, again the songs are sung by teachers and children before transitioning to snack time.

d) Snack time (9.00-9.30am)

Snack time begins with the children lining up and going to the eating area. The children washed their hand in the wash basins provided. Then they sat down on the mat on the floor where the plastic plates and cups had already been placed. Many pre-schools in Malaysia, regardless of orientation, ask the children to sit on the floor due to space constraints. Depending on the snack provided, they either ate with their hands or they used utensils. During my observations, they have Malaysian traditional food which is "Nasi Lemak" and fruits.

Table 6.2-1(a): Schedule for a regular school day in Pre-school A (Morning Session).

Times	Activity	Teacher/child directed
Arrival- 8.15 am	Children arrive and are greeted by staff. The children stored personal items and free play with selected item, took place.	Self-directed play, Child initiated
8.15 - 8.30 am	Assembly	Child and adult directed
8.30-9.00 am	Circle time	Child and adult directed, language and social focus
9.00-9.30 am	Snack time	Adult directed, self help
9.30-10.00 am	Group activity	
10.00-11.30 am	Free play	Child initiated Play
11.30-12.00 am	Small group activity	Child and adult directed
12.00 am - departure	Outdoor play	Child and adult directed
12.30 am.	Dismissal	

Table 6.2 1(b): Schedule for a regular school day in Pre-school A. (Afternoon Session)

Schedule for afternoon session		
12:30 to 1:00	Lunch time. Outdoor play, quiet indoor play, stories, listening to music, browsing through books	. Child initiated
1.00pm-3.00pm	Nap or rest. Wake up and dressing. Toileting. Listening activities continue for those who are awake. Older children may have a shorter nap and participate in quiet activities	Child and adult directed
3:00pm to 5:45pm	Afternoon snack. Guided activities indoors and outdoors. Children leave gradually. Clean up.	Child and adult directed

e) Group work (9.30- 10.00am)

For the children in this pre-school, class work consisted of the regular subjects (mathematics, English, the Malay language, Science, or arts). In the language classes, the children learn to read and write the simple Malay characters. In math classes, they learn number or concepts, numeral recognition and addition, and number manipulation are frequently incorporated into the lessons.

f) Free Play (10.00 –11.30am)

During this time the children can choose between art, painting, play dough, sand/water table, blocks, housekeeping, puzzles, games, books and the computer. As they finished, the children put away toys and materials and they moved directly into the small group time activity.

g) Small Group activity (11.30 am-12.00 pm)

During this time the children work on activities in groups of 4-5. Small groups give the children opportunities for project development, construction, art expression, language and literary experiences and fine-motor development.

As one of the teachers stated that "our goal is to familiarise the children with the basic rules of the programme or project in which the children are involved, to help them learn to work individually with the materials and to become accustomed to the questioning process that encourages them to think about what they are doing with the materials".

After they had finished the small group activity, the children again have a snack and prepared to go outdoors.

h) Outdoor Play (12.00 – 12.30pm)

During outdoor play the children are encouraged to free play and exercise their bodies and imaginations. All children are encouraged to be active while outdoors; sometimes this involves an organised activity or game initiated by the children and/ or the teacher.

A variety of outdoor play equipment, including large plastic blocks, balance beams, sand play accessories, hoops and a large one-metre diameter climb-through ball, was made available from the store on a daily basis.

i) Dismissal (12.30pm)

The school day officially ended after 12.30pm. Before their parents arrived, the children again had time for free play. Children also have their materials to take home in their cubby. The person/parent picking up the child must sign the child out on the sign out form.

All times are flexible due to the activities of the day, but the general pattern will be followed to create a comfortable routine for the children.

6.3. Part two-Six major themes discussion

As mentioned above, the second part of this chapter, discusses the findings of the data analysis which were organised into six major themes. The following are explained:

Theme 1: Computer facilities in the classroom,

Theme 2: The teacher's belief, views and knowledge about computers

Theme 3: The status of the computer in the classroom

Theme 4: Children's interests, feelings and views about computers.

Theme 5: Children's social interaction with peers

Theme 6: Children's social interaction with teachers.

6.3.1. Theme 1-Computer facilities in the pre-school classroom

This section on computer facilities in the selected classroom is divided into three categories: a) Resources, including hardware, software and technical support, b) location and arrangement of the computer centre c) Equal access to the resources.

6.3.1.1. Resources and location of the computer

The results of the observations showed that the classroom had two computers (Windows 98 with 64 Mb) in the computer centre with the CD Rom. The computers had a very limited capacity. They frequently crashed or stalled while the children were using them. There was no printer or scanner and the internet was not connected to the computer.

One of the teachers in pre-school A highlighted that they needed a more up to date computer for the centre.

> "Sometimes computers are not working and crashed frequently. Certain CD's we have are also not working and we always spend a lot of time to settle these problems but honestly we run out of time" (Interview with Jamilah, 2/11/2005).

Another teacher described the computers in this classroom as follows:

> "The computers we have are old. They have limited capabilities. It does not have internet connection and you know.......it has a limited amount of power. It can't even run some of the children's games well that we're interested in running". (Interview with Ayuni, 3/11/2005)

In this classroom, the computers were in use most of the time and were mainly utilised for playing games. Flintoff (2002) argues that computer games can be useful in enhancing memory capacity, in concentration of attention and in the problem solving strategies of young children, which can indirectly affect their academic achievements. Children played in small groups or sometimes alone, using the computers in turn.

6.3.1.2. Software (In the main chapter refer to the descriptions that are in the Appendix I)

Another key element in the beneficial use of technology is the availability of software that is developmentally appropriate. The National Association for the Education of Young Children (NAEYC) (1996) and Haugland (2000) supported computers and computer software use by young children (3 to 8 years old) if the environment and equipment are developmentally appropriate. "Choosing appropriate software is similar to choosing appropriate books for the classroom--teachers constantly make judgments about what is age appropriate, individually appropriate, and culturally appropriate" (NAEYC, 1996, p. 2). Therefore, in connection with the above matter, the pre-school teachers were also asked how they chose the computer software.

However, according to Jamilah she has lack of exposure to software that helps learning and teaching. Both Jamilah and Ayuni agreed that they have a lack of time to explore and use unfamiliar software. As Ayuni explained that,

> "Honestly, I don't really know enough about how to buy software for our computer. I wouldn't even know how to get software. I have no idea what that means, so I wouldn't be able to buy software for it, I am just getting what is already available here (In the classroom)".

And according to Jamilah,

> "Some software has too many text boxes, graphics, buttons, and sound...too many questions from too many directions. I really can't understand it"(Interview with Ayuni, 3/11/2005)

This relationship was quite clearly articulated by Ayuni and Jamilah who described their ability to select software for use in the classroom as limited by their knowledge of the computer.

Despite this frustration, both of the teachers still viewed the selection of software as a pedagogical factor of importance when using a computer in the classroom. Although hampered by their lack of understanding regarding the computer's specifications, they nonetheless detailed the importance of selecting software appropriate to the children's learning and developmental needs from that actually available to them.

In relation to this, all of the teachers stated that the software was chosen based on the Malaysian pre-school curriculum. One of the teachers in pre-school A stated:

> "The software was chosen if the software encourages social/emotional development (e.g., interaction, cooperation, self-concept, inhibits gender and culture stereotypes, and promotes positive attitudes toward computers) and cognitive development (e.g., increases thinking, reasoning, problem solving, stimulates play)". (Interview with Ayuni, 3/11/2005)

In addition, another teacher stated that they also selected the computer software based on whether or not it is age, individually, and culturally appropriate, process rather than product oriented, allows for trial and error, and encourages child control, independent use, and growth in different developmental domains (social, emotional, cognitive, and physical)".(Interview with Jamilah, 2/11/2007).

A proliferation of computer software for young children and a pressure to use computers in early childhood education (birth to age eight) necessitate early childhood teachers to acquire skills in selecting appropriate software. "Teacher training is essential for computers to be an effective teaching tool" (Haugland, 2000a, p. 3). For early childhood teachers to select software for their classrooms, they must be familiar with software and be able to evaluate not only the quality of the software but its appropriateness for young children

6.3.1.3. Equal access to the resources

In this classroom, the children accessed computers during free play times, which were one and half hours (10am-11.30 am) in the morning. During this time, the children usually played on the computer with supervision from the teachers. The teacher's general policy at the computer area required teacher's assistance for the children while setting up the computer and game. As a result of this adult assistance, their computer worked properly during the whole observation time. They were flexible about how children used the centre. Only a certain number of children were allowed at one time for each computer. In terms of equal access, all teachers stated that they encourage the children to share the play instead of waiting for somebody (Field note, October 2005).

One of the teachers explained the rules of the computer centre;

> "We have the "rabbits" and the "cats". Children have their rabbit and cat nametags. As for the computers, we have two name pads in that centre, one to use and one to view. Let's say the entire computers are full, and then we have a child who wants to use a computer. Just like any other centre, we let them negotiate; work it out, with students. Like, "He is playing with it now. Why don't you make a deal with them?" You know, "Why don't you play with it for another five minutes and let another child on it." And it really works. So if the computer were hot item and we have a lot of children want to play with them that is what would happen. The children would get rotated in and out, so they get to play with computers just like in any centre." (Interview with Jamilah, 2/11/2005),

From my observations, all the teachers in pre-school A (Jamilah and Ayuni) were very flexible about how much time the children spent at the computer. They allowed the children to stay at the Centre as long as they wanted. One of the teachers explained:

> "Sometimes the children use it pretty much independently and spontaneously and play whatever software we have there...we are not strictly five or ten minutes for each child" (Interview with Ayuni, 3/11/2005)

Jamilah also supports this idea and said that;

> "I am prone to let the children spend as much time on it as they want. And my argument is that if it was blocks or dollhouse or any other activities, we wouldn't even be having this conversation". (Interview with Jamilah, 3/11/2005)

In terms of equal access, Ayuni emphasised her idea of sharing experience. According to her, instead of waiting for somebody, children should share their play:

> "I don't like the child just sit and wait for his/her turn......We prefer that they share experiences. Um, there is a sense of community there and, um, and those that can't, can always give their name and go someplace else. We prefer that they play together, um, and they hold conversations". (Interview with Ayuni, 3/11/2005).

Both the teachers explained that the children can play on the computer in a group or alone. As Ayuni explained'

> "We allowed the children to play alone or in pairs, basically whoever would like to work together, as long I know that they get along well, and they are not going to.....there's no in-fighting or anything like that". (Interview with Ayuni, 3/11/2005)

However, working in pairs or groups can be problematic (Cowie et al., 1994 Johnson & Hohnson, 2001). Whilst, they might motivate the children, the restriction of diverse opinions might also inhibit the effectiveness of the work as in findings 8 (Zaidi, Lan and Ali - field note,11/10/2005)

6.3.1.4. Technical support

All the teachers stated that sometimes they had difficulties receiving technical support for computer problems. All the teachers possessed very limited knowledge about computers. They often needed help repairing the computers when they were not working for any reason. One of the teachers explained her difficulties receiving computer assistance:

> "When we have a problem with the computer, and when we asked the university computer centre for help, normally it will take two to three weeks to settle down the problem". (Interview with Jamilah, 2/11/2005).

As one of the teachers reported;

> "When computers go down or software locks up when children are on the computer, there is no one available at this school to remedy the problem and this leads to frustration on our and the children's part." (Interview with Ayuni, 3/11/2005)

She also highlighted that they really need a computer assistant or some one who could help them with computer problems. She acknowledges that she was not a high-tech person. Although she knew a little bit about computers and used computers for her own needs such as word processing and using email, she was not capable of troubleshooting or fixing the computer (Interview with Ayuni, 3/11/2005).

Technical difficulties or problems with computers were identified as another barrier to incorporating computers in teaching.

> "The computer will crash suddenly or something...or the mouse plays up, but those are things that just happen, and you just have to overcome them and do the best you can...sometimes we have problems with the computer software". (Interview with Ayuni, 3/11/2005).

6.3.2. Theme 2-Teacher's beliefs, views and knowledge about computers

Computers provide many opportunities for new learning and activities. Higgins and Moseley's (2001) found that teachers' "beliefs" play an essential role in their classroom practices and affect their teaching and learning interactions' (p. 204), including those associated with computer use in the classroom. Therefore, the teachers were asked the questions associated with relationships among computers, educational settings, and the way computers are perceived and utilised by children and teachers in pre-school classrooms.

Generally, all teachers believe that computers can assist children to learn as expressed by Jamilah from pre-school A

> "I sincerely believe this has been one of the most successful changes we have in our classroom (have computer). The reluctant computer users can be at the centre doing other things and observe what is happening on the computer until they are ready to try it themselves. There is almost no arguing over whose turn it is on the computer, because there are many other things to do at the centres until the computer is free for them to use. Students all have access to the computers many times per day. The students really have a chance to experience the fact that computers are tools that can be used for many different purposes. I am very excited about this integration of technology in my classroom on a daily basis."
> (Interview with Jamilah, 3/11/2005)

As noted in Jamilah's explanation, computers were available in this classroom and they were there to provide children with basic skills and experiences. She was aware of the potential and benefits of the computer for children's learning and development. Therefore, her purpose for having computers in the classroom was to provide the children at least with basic computer skills and to have children become familiar with the computers. However, she stated that she had limited experience with computers and had not taken any computer training classes or workshops about how to use computers with young children (Interview with Jamilah, 2/11/2005).

One of the reasons for using a computer reported by the educators was that the children needed to be kept 'up to date' with technology. This idea was stated immediately by one teacher:

> "Because it is something that I know is very necessary for children for their future. The children need to be up to date, it is important. I think they actually need the skills for it, and even if they are just exploring I think it is really good for them!" (Interview with Ayuni, 3/11/2005)

For this teacher, the decision to use a computer in her classroom was linked to the idea that children needed to remain up to date with the technology.

A similar idea was expressed by another educator:

> "Because children start computers sort of right through now, and they need to feel relaxed on it, and I think they actually need the skills for it, and even if they are just exploring I think it is a good part of the curriculum" (Interview with Jamilah, 3/11/2005)

For these two teachers, the decision to use a computer in their classrooms was linked to the idea that children needed to remain up to date with the technology. It was interesting to note the way the educators continued to discuss this decision in relation to their perceptions of the early childhood curriculum

Siraj-Blatchford and Whitebread (2003) have noted that some early childhood teachers reject the use of computers in their classrooms because of the assumed passivity of computer use by young children. They cite research evidence to the contrary, arguing that 'the use of appropriate ICT technology can be a very active, social, intellectually stimulating and liberating experience for young children, which opens up new possibilities for them in a variety of areas' (p. 28). Brooker (2003) argues that this perception is likely linked to the tradition in early childhood education that children freely explore a range of 'natural' materials, suggesting that (despite research to the contrary) 'we are innately reluctant to hook children up to machinery of any kind, as if it deprives them of the physical freedom and intellectual innocence we hold dear' (p. 263). Thus, as Ayuni described, the computer may be viewed as a passive rather than active educational experience, albeit one that still provides opportunities for children to acquire computer skills associated with remaining 'up to date' with technology.

Jamilah believed that computers can assist children to learn, as expressed by Jamilah from Pre-school A.

> "They are a valuable tool, but they are not the end to their learning. For me, the computer will assist the children with many things that they would like to experiment with and find different things with, but it is essential that they experience the senses in everything that they do and not just sit in front of the computer screen. It's a useful tool and it's a valuable tool. Every pre-school should have the computers in their classroom" (Interview with Jamilah, 2/11/20050

In addition, another teacher from pre-school A also mentioned that, having a computer in the classroom could be helpful to make things equal. She stated that;

> "The computer makes things equal. It really helps those children who usually don't do too well, you know, who aren't as fast as other students or who are shy. The computer gives them, a chance to be good at

something. And so, it helps them in other things. (Interview with Ayuni, 3/11/2005)

Then she added,

> "It is good for children to help them in the learning process and also as introduction in using computers", (Interviewed with Ayuni, 3/11/2005)

6.3.2.1. Barrier for computer use

In general, all the teachers mentioned that an over-crowded programme restricts the time they can devote to using computers in the classroom.

> "Probably it has to do with crowded programmes. I guess there is just so much to do and so little time to do it in and there are so many things you need to do...so with all the different areas...we have too many things here!"(Interview with Jamilah, 2/11/2005)

> "Everything is very prescriptive now...we've got our own activities plan. There isn't really too much time and we have an amount of planning and everything that we have do and to explore. As it is... I'm struggling to fit in what's already on the planner...we have so many various programmes at our pre-school. It's very, very crowded". (Interview with Ayuni, 3/11/2005)

The emphasis upon learning as a process requires that teachers need time to explore new curriculum ideas, learning how to handle technology and effectively integrate technology into the curriculum. Ayuni expressed how the business community can assist teacher learning.

> "I think we need to get some kind of connection with the........for example computer industry and get us all prepped for that generation that is coming through, because this generation of children that are coming through.... are the technology-age children and we need to cater to them...although most of us come out of teacher training college that give us the certificates, but when we put ourselves in a classroom we don't have those skills for the generation that is coming through...We need to work with businesses and we need to know how to make a web page for example, so that we can give those skills to those children that will benefit from it as well". (Interview with Ayuni, 3/11/2005)

Furthermore, a barrier that one of the pre-school teachers pointed out was that the result is negative if the time using a computer in pre-school is limited. Pre-school teachers stated:

> "If the children did not have time limitations then you could create tension between children who use the computer and those who don't."(Interview with Jamilah,2/11/2005)

Another barrier to use of the computers in the pre-school classroom can be the fear held by teachers of losing control over their children. This was backed up by the following quote from Ayuni:

> I think one of the issues for me has been sort of "losing control", you let them over to the computers to do things and you don't know exactly what they're doing. Sometimes there is no doubt that they become more distracted and sidetracked when on the computers, they like to explore what else is on the computer too." (Interview with Jamilah, 2/11/2005)

And according to Jamilah,

> "I think the major challenges to be faced in the integration computer in the classroom will be the pedagogical implication, the impact on the structure and the content of the curriculum, classroom organisation and practice and the changed role of the teacher". (Interview with Jamilah, 2/11/2005)

6.3.3. Theme 3-Status of the computer and play in the classroom

In this category most of the pre-school teachers said that there was a positive atmosphere when the children worked at the computer. The children helped each other and there was good collaboration. The children can work on activities where there were no other opportunities, for example, boys and girls working together, which would not occur otherwise. Another reason to use a computer in this setting was that the children have a positive connection with each other when they solve the problems together. As one of the participants explained that before they had begun working with the computer in the pre-school, she had preconceived ideas about what it would be like. She thought that the children who worked on the computer were the children who were best at using a computer and that the other children would only sit beside them and watch. Instead children cooperated more than she thought they would. According to some of the pre-school teachers the children thought that it was exciting and fun to sit at the computer. Jamilah, from pre-school A highlighted the connection between the computer and children's play. She stated that:

> "It is very useful and important. We can't separate children from computers. And also from computer play, we can see the children develop, socially and emotionally. Parents and teachers can see this, especially when children interact with their friends. If you just teach one way, you can't see the real child or their personality, but through play during interaction with their friends, their characters will surface. So I feel that it is very important for all the pre-schools to put the computer in their curriculum." (Interview with teacher, Jamilah, 3/11/2005)

And according to Ayuni,

> "Yes we would, children like adults get bored when they do the same things over and over again. With the computer, their attention is channelled to something interesting and exciting. It stimulates their interests. With adequate aids, such as educational toys and games, play with computers actually improves the children's coordination, thinking and analytical abilities. (Interview with Ayuni, 3/11/2005)

In general, the computer activities in all classrooms were focused on children's development as mentioned in Malaysian pre-school curricula. There was a strong connection between curricular priorities and how computers were used in these classrooms. It is also recommended that pedagogical approaches needed to shape the use of computer technology (Downes, Arthur & Becker, 2001). In this classroom, decisions related to the computer technology were affected by the centres overall curriculum. This classroom was an example of a general early childhood curriculum that emerged from the idea of providing a child-centred curriculum, in which children's interest and needs were highly valued and the programme was shaped accordingly. Thus, this classroom curriculum focused on providing rich play experiences and opportunities for children. In this pre-school, the selection of software and the design of computer activities were also related to the curricula. Drill and practice oriented software were commonly used in this classroom. (Field note, October 2005).

The study also indicated that all the children in pre-school A would like drill and practice software better than open-ended software (Field note, October 2005). The following reason can explain why most of the children prefer the drill and practice software over open ended software. In Malaysian society, the value of academic activity is more emphasised than that of play. Free play time in that kindergarten each day was only one and half hours, and the play materials were limited. Research has shown that the types of toys and activities offered can affect children's social and cognitive play (Rubin, 1977). The play materials and activities provided in this classroom tended to be more manipulative, skill-driven and product oriented; therefore, children engaged in more tasks and work than play; more constructive play than dramatic play. Thus, the open-ended software which required creativity and imagination seemed to be difficult for Malaysian children to work with. The results of the study were consistent with the study of Escobedo and Evans (1997) that high ratings by professionals are not always related to children's selection. Some children prefer the programme which is developmentally inappropriate for them. The popular software preferred by young children, whether developmentally appropriate or not, featured animation, music, surprise elements, and high interest topics. Therefore, before implementing them into the curriculum it is better for the teacher to child-test software programmes. Teachers should not only take the professional rating as a guideline, but also closely observe children's preference and their behaviour in different computer environments to determine what is beneficial for them.

The results from the observation showed that when playing with drill and practice software, children tended to order and give directions to the other children about what was supposed to be the right way to do something by saying "click this one," "This one goes here," and so on. (Field note 23/10/2005, 5/5/2005, and 12/5/2005)

The results were partially consistent with Borgh and Dikson's (1986) finding that children emphasised correctness when playing with drill and practice software. The results also showed that assisting behaviour was more likely to occur in the drill and practice environment than in the open-ended one. The explanation for this result is that drill and practice programmes are more difficult to control and less user friendly than the open-ended software. For example, the programme required the children to drag the object not only to the right place but also to exact spot.

In this classroom, computers are only part of the playroom centre activities. All teachers viewed computers as a non integrated part of the classroom. They stated that they did not integrate computers into their classroom's curriculum. The children in this study used computer only for play purposes (Field note from 15/9,19/9,23/9,27/9,30/9,4/10,18/10,27/10/2005). The computer activities remained within the playtime rather than being integrated across other activities and classroom themes. One of the teacher's explained that

> "Computers are used only during the free play time........especially for playing games". (Interview with Jamilah, 2/11/2005)

The Malaysian pre-school curriculum philosophy was that children learn best through play and exploration of their environment and the teacher's role was to set up each stage for the children's learning. Based on this philosophy the teachers set up the computer centre and let the children explore it. One of the teachers explained that,

> "If a child is interested in computers, we let them do that. We do not force them to do anything. They do what they want to do" (Interview with Ayuni, 3/11/2005)

Through observation, interviews and documents collected from pre-school A, it was clear that computers existed as part of the play materials in this classroom rather than being integrated into their curriculum. From the interviews, all the teachers revealed that the computers were not integrated into their classroom and computers were only used during children's free play time as a part of other play materials that were arranged in advance for children's play. Therefore, the computer served one purpose: game playing. Simply setting up the computer and providing various software does not constitute an integrated use of computer technology (Davis & Shade, 1999).

In this classroom, the computers were placed as an add-on or extra play centre material for children to play with rather than serving as an educational tool that helps children and teachers achieve their educational and personal goals (Pierce, 1994). The integrated use of computers in early childhood classrooms is defined as using computers in any numbers of ways in which computers could support instruction in a wide variety of curricula areas (Davis & Shade, 1999, Haugland & Wright, 1997; NAEYC, 1996; Tsantic & Keefe, 1992). Unfortunately, in this classroom, computers existed only as a part of the free play material. One of the teachers expressed tension between what was a valued skill and its presence in the actual curriculum. A similar finding was noted by Plowman and Stephen (2005), whose investigation into the use of computers within seven early childhood settings noted a discrepancy between teachers' understanding of the role of play and active learning in the traditional curriculum and their role in children's use of computers.

From the interviews, all teachers in the selected pre-school pointed out that lack of training, resources and time were the main reasons for their failure to integrate computers into the daily activities of the classroom. Along with these issues, the teachers' attitudes towards computers played an important role in not integrating computers into the curriculum. Inadequate resources were also an enormous challenge for the classroom. The lack of supporting technologies such as a printer, scanner or digital camera and low capacity computers also created difficulties integrating computers into the daily activities.

Placing computers into the classroom has not guaranteed their integration into the educational programme. Without proper teacher training in the use of technology, a computer will be likely fail to deliver on its promise of improving children's learning (Hohman, 1994). It has been recognised that teacher training is required in technology integration (Davis & Shades, 1999; Haugland, 2000; Morgan & Shade, 1994). Unfortunately, in this classroom none of the teachers received any type of staff development in computer integration. One of the teachers explained that:

> "I only can use the word processor. I haven't really ever had a class or workshop that teaches me how to use or integrate the computer into the pre-school curriculum." (Interview with Jamilah, 2/11/2005)

One of the teachers stated that, she was sometimes frustrated with the computer problems and watching the children in other centres was more important than fixing the computers, (Interview with Ayuni, 3/11/2005). So, it is almost impossible for teachers to integrate computers successfully without acknowledging the potential benefits of computers for children's learning and development, and dedicating time and effort to this cause. The selected pre-school exemplified the common problems related to the computer integration in early childhood education. The fact of simply placing a computer in the classroom has not ensured the integration of computers into the classroom.

Given the need for teacher training to support integration of computers into the pre-school classroom, inadequate resources remain an enduring issue for implementing computer technology in Malaysian pre-schools. The selected pre-school did not have the resources to invest heavily in computer equipment. The high cost of equipment has been the major challenge to the use of computers in early childhood education (Morgan & Shade, 1994). Therefore, in this pre-school, the computers were second hand and have a very limited memory capacity.

Although the computer has not been integrated into the daily activities, the teachers in this classroom are actively involved in the computer area, constantly observing, interacting, asking questions and acting as a tutor as needed. In pre-school A, the teachers constantly assisted children while they were playing with the computer. The teacher-child interaction in the classroom is also considered as scaffolding. A brief example of scaffolding when children played with the computer is shown below: (See appendix V the list of the children pseudonyms)

Wani: I would like to play with this game. (Showed the CD to the teacher)

Teacher: Let's start the game.

(Teacher loaded the CD)

Wani: Umm.....I like it!

(After the game started, she controls the mouse and looks at the screen)

Teacher: Do you know how to find the clues?

(While listening to the introduction of the game)

Wani: Ummm.......I will try to find them.

(She clicks the pictures on the screen and goes to another page)

Teacher: What do you need to do now?

Wani: Ummm....(She randomly clicks the pictures on the screen)

Teacher: Listen to the song that Darby is singing. You might find the clues.

Wani: The book!...the book!..I got it! (So she clicks the on the books)

Teacher: Yes. You find one of the clues. Where do you want to go next?

(Field notes from, 25/10/2005)

As seen in this illustration, Wani was able to find the clue and solve the problem with the teacher's assistance. The teacher-child collaboration and support allowed Wani to move forward and continue to build new competencies. As Vygotsky (1998) states that, "human learning presupposes a specific social nature and a process by which children grow into the intellectual life of those around them" (p.87). In a collective activity or under the guidance of adults, children are capable of doing better (Vygotsky, 1978). Therefore, through teachers' scaffolding children effectively learn with computer technology (Chang, 2001). It has been found that adult mediation in pre-school computer learning environments facilitates informed use of computer technologies and has positive effects on children's performance (Klein, Gal & Darom, 2000).

From the observation, it was found that all teachers in pre-school A displayed this type of scaffolding when children play with the computers in the classroom. The continuous scaffolding made children's computer experiences beneficial and comfortable. More importantly, the children in the classroom performed better in computer tasks and become more confident.

In terms of computers and play, all the teachers expressed the same view about the concept of computer and play and they accepted that children learned through play. In all classrooms, decisions related to computer technology were affected by the Malaysian pre-school curriculum. However, through the limited computer integration it was impossible to expect high levels of positive contributions of the computers to the overall goals of the classroom.

6.3.4. Theme 4-Children interests, feeling and views about computers

In this classroom, there were 42 children aged ranges from 5 to 6 years old. The majority of the children come from families that were university faculty, staff and students. The children were very vigorous, noisy, and joyful and they were actively involved in the learning centres. The most popular centres were housekeeping and building (blocks) Centres.

During the entire classroom observations, only 14 of the 34 children spent a reasonably length of time in computer centre. The other 20 children played at the other play centres in the playroom. During all the observation days, at least one or two children played with the computers. Of the twenty days observation, less than 3 children played with the computers for only two days. When the children were in the computer centre, they prefer playing with peers rather than alone.

The maximum time a child spent at a computer was 65 minutes and the minimum time a child spent at the computer was 10 minutes. In general, it was assumed that the length of time each child stayed at the computer indicated their interests. The results from the table 6.3-1 indicated that the children's interest in the computer were very high. From the total of 20 days of observation, during which the children sat in front of the computer, there were nine instances where they spent fifty or more minutes playing with programmes those children were Zaidi ,Wani, Afifi, Ramlan, Azhar, Dina, Said, Zaki, and

Tina played for long enough to explore and engage in the game they chose. They actively used the software and engaged in computer play. Other children, Athirah, Yati and Nusrat spent approximately 40 to 60 minutes in total during the twenty days observation when they were only able to choose the software and start running the game for a few minutes. Then they left it unfinished.

As indicated in table 6.3-1, the three children who used the computer most often were Zaidi, Afifi and Dina. Actually, according to their teacher, they were quiet children and rarely talked with adults or teachers. But it is interesting to notice that, they always spoke with their friends while playing with the computer. Zaidi for example, was confident and comfortable when playing with the computer. While I was observing him in the computer centre, he naturally clicked the right places on the screen and was mostly able to carry out the game. One of the teacher's said, "He loves computers. He likes to play games. So we keep CD games out all the time because he likes them. He does not like to talk to adults but prefers to talk with another child". (Interview with Ayuni, 27/10/2005).

Five children, Zaidi, Afifi, Dina, Luqman and Said were more proficient with computers than the other children (Field note, 3/11/2005). They were able to operate the computer alone and use the mouse efficiently. The rest of the children sometimes had difficulties using the mouse (Field notes from the classroom, October 2005). Very noticeable was the fact that the children who had difficulties using the computers preferred to play with the computers with peers. For example, Nusrat and Zaki who had difficulties using the computer never played alone with the computers. The teachers recognised these issues and acknowledged the possible benefits of playing on the computers with these children.

A number of studies have attempt to establish numerical values for an optimum length of time for a child's use of the computer. Anselmo and Sinck (1987) found that 4 and 5 years olds chose to spend 22 minutes on an average using a computer, and 5 and 6 year olds 29 minutes. Harbeck and Sherman (1999) recommended that young children use a computer for between 15 and 20 minutes. According to King and Alloway's (1992), observations, the children's interest peaked at 28 minutes, and by the end of the study children were using the computer for an average of 13 minutes. Haugland and Shade (1994) conducted research with pre-school children and found that they chose to use a computer for an average of 14 minutes in each 1-hour session of free play.

Dates	Children's names													
	Zaidi	Wani	Ani	Afifi	Lan	Nus rat	Azhar	Dina	Yati	zaid	Luqman	athirah	Zaki	Tina
10/10		20		35			25				15			20
11/10	35	15			35			30			25			
12/10				60					10				25	
13/10	25	15			35	10	30			25		15	35	
14/10	10		15		55			40			10			
17/10				30				35				10		
18/10	50	15					10			25				30
19/10			55				60		10	10	35			
20/10				15				15				10	55	25
21/10				25		10				50			15	
24/10	15						40							20
25/10		50						15			10			
26/10					10			10				10		60
27/10	15		20	20			10		10				15	
28/10	30					10		65						
31/10		10	10	35						20	20		15	
1/11					20		15		15					25
2/11	40	10	35		25						15			
3/11				25			10	25	10	30		15		
4/11	25			30		10					10		15	
Freq.	**9**	**7**	**5**	**9**	**6**	**4**	**8**	**8**	**5**	**6**	**8**	**5**	**7**	**6**
Minutes	**245**	**120**	**135**	**275**	**180**	**40**	**200**	**235**	**55**	**160**	**140**	**60**	**175**	**180**

Table 6.3 1: Children's Estimated Time Spent in the Computer Centre

In this study the average amount of time for which the children used the computers was less than 30 minutes. There are three contributing factors to these results. The first is, given the interpretive premise of the study, the individual differences in the children have been considered when analysing the results, and clearly, the sample size is too small to be representative of all children in this age bracket. The second factor concerns adult intervention activities and the nature of the software. As the software used in this study provided a variety of activities, and as the child's interest in one activity waned they were asked if they wish to try another activity. As this process was repeated several times, this ensured that when the child's interest was waning and they may have left the computer, they were encouraged to remain by introducing another activity. The third factor contributing to the children's time spent using the software was that the child user was able to locate their favourite activity within the virtual world of the computer. As an example, Zaidi spent 40 minutes interacting with the colouring and painting activities as the colouring book was the child's favourite real world activity.

The results from the table 6.3-1 showed that the children spent a considerable amount of time playing or watching others play in the computer area. The children who played directly with the computer spent a longer time than the children who were watching or waiting a turn. Additionally, all ten of the children in the classroom who volunteered for the mini interviews state that they liked to play with computers. In the interview, Wani said,

> "I like computers. I like Darby and Dragon. I like that game because I play it on my brother's computer". (Interview with Wani, 5/11/2005)

> As Lan said in the interview,

> "I like computers because I can play games." (Interview with Lan 5/11/2005)

Interview with Afifi (5/11/2005)

> I: Do you like computers, Afifi?

> A: Yes.

I: Why do you like them?

A: Because I like playing with computers

I: What do you learn from the game?

A: New things and some old things.

Interview with Azhar (5/11/2006)

I: Do you like computer?

A: Oh ye!

I: Does your friend help you with the computer?

A:Yes, Zaki and Megat

I: What are the best things to do on computer?

A: Drawing, painting, writing and playing games

One of the children (Dina) initially stated that the computer was what Daddy worked on. However in general, the children see the computer as a toy or a game; they saw it as similar to a Nintendo game (Field note, October 2005)

However, during the observation, one of the children who did not use the computer at all during the whole observations period (20 days) stated that she hated computers. She said, "I don't like computer at all. Computers are dumb. I hate them. Why do you like them?" (Interview with children, 6/11/2005). For her computers were not fun to play with because they were broken all time.

I was amazed to find out that all the children were aware of what a computer is and most of them said that they are always looking to see if there is a computer in a place they visit. Although 6 out of 14 children in this study neither played with nor had a computer at home, they were aware of what a computer was. When these children were asked, "what do you think that a computer does? Many replied that "you can draw" or you can play games, like "Free cell," "Super Mario, and "Minesweeper". One of the children said that the computer is used to write some text and to play some games designed exclusively for computers. The latter is indicative of the knowledge that children have about some of its applications. (Interview with children, 5/11/2005).

Overall, the children enjoyed using the computer and preferred to use it with peers or a teacher rather than alone. Additionally, the children's activity at the computer was not significantly altered by the presence of the teacher and researcher. The observations indicated that pre-school children can work effectively and cooperatively at a computer with minimal teacher supervision and that the computer does not appear to attract children to the detriment of other areas of social and cognitive development.

Table 6.3-2: Children's perception of working with a partner or alone

1. **With partner/alone**	2. **Children response**
3. With partner:	a. Need help b. Have more fun c. Like the partner 4. 4) Not boring
5. Alone	a. No bothering/quieter b. Competitive 6. 3) Don't like the partner

With regards to the questions about their preference of playing with a partner or alone, most children in pre-school A responded that they preferred to work with a peer than to work alone. Table 6.3-2 presents the responses given by the children when they were asked about their perception working with peers or alone.

6.3.5. Theme 5-Children's interactions with peers

The second part of the study focused on the children's peer interactions at the computer. Appendix V presents the profile of the children focused in the study. The focused child refers to the children who spent most of their time at computer centre (more than 20 minutes) during free play period (10am-11.30am).

Data analysis yielded the following significant patterns of interactions, namely;

1) Interactions between peers,
   a) Conflict/ resolutions with peers

2) Interaction between teachers and children,
   a) Conflict/ resolutions with teachers

3) Individual children's computer use.

In this phase the proportions of females and males were almost balanced. The breakdown of the sample by gender is presented in table 6.3-3. During this period a group of 14 children aged from 5 years 2 months to 5 years 9 months were observed for a total of twenty days. The parents of these children had given their permission for them to participate in this research. As mentioned before, all the observations took place in the classroom during the free play period in the morning from approximately 10.00am-11.30am. Appendix XI showed the list of children and date of observations.

Table 6.3-3: Sample sizes by Gender

Number of Females	Number of Males	Total
6	8	14

The children were observed during their free play period. During this time the children had a choice of computers, snacks, blocks, books, dramatic play or art. The children could do any number of these things during the hour and thirty minutes. Immediately before and after this choice time were group activities. At any time there were at least two adults (teachers and/or assistant teachers) in the room with the children.Children worked on individual computers that were placed side by side. Sometimes an additional child would join as an observer. All observations of the children were done as non-participant observation with the Children's Social behaviour Checklist being the primary form of data collection. Two observations were videotaped. Ten children were informally interviewed at the end of the study to understand better their feelings about using the computer.

A variety of software was used for the purpose of the study. Within this software there were several different programmes that the children could choose from. During the observation time, the children were offered a choice of CD-ROMs and access consisted either of the CDs being preloaded and selected from the desktop for the programmes such as, city, farm, animal creation, games creation, painting, colouring and others or the disks need to be inserted into the CD drive.

Children's freedom to choose resulted in very varied patterns of engagement with the computer. Some children were observed intently engaged with games that had been set up before they arrived at the computer while others were observed flitting between games and changing the CDs.

Table 6.3-4: Dates and Total of Children Using the Computer

Dates	Total of Children Using the Computer
12/10,17/10,24/10,25/10,28/10	3
21/10,26/10,2/11	5
10/10,11/10,14/10,18/10,19/10 20/10,1/11,4/11	4
27/10,31/10,3/11	6
13/10	8

Table 6.3-4 showed the dates and the number of children using the computer for each day. A different number of children used the computer on each observation day. This situation was outside researcher's control because the length of time that each of the children spent at the computer on any given day was determined by the children themselves.

Table 6.3-5 illustrates the frequency of the seven subcategories of cooperative behaviour occurring each day of observation period. Over the course of the study, there were 652 occurrences of children's social interaction with peers during computer use. On certain days more interactions between children were observed than on other days. More interactions were observed on 13/10 because on that date there were 8 children using the computers. There were less interaction were observed on 17/10 and 24/10 as the number of the children using the computer on that date were 3 children for each day. For each subcategory, an excerpt of children's conversation is provided to understand better the nature of each type of social interactions.

Table 6.3 5 : Child Collaborated With Peer at the Computer

	Speaks or signs to peer at the computer	Asks questions or signs question to peer about an activity	Takes turns at the computer	Shares idea with a peer	Explains to another child how a device or programme works	Directing and Tutoring	Moves to improve his or her view of the monitor without interfering with others	Total
10/10	5	6	3	5	6	5	2	32
11/10	5	6	3	5	6	9	3	37
12/10	6	5	2	5	7	10	2	37
13/10	4	8	4	8	4	10	3	41
14/10	5	4	3	4	3	5	2	26
17/10	3	2	3	2	5	3	2	18
18/10	3	8	4	6	5	7	2	35
19/10	5	6	2	5	6	6	3	33
20/10	6	6	2	6	4	8	2	34
21/10	5	6	2	7	7	9	3	39
24/10	2	2	3	2	3	3	4	19
25/10	7	5	4	5	5	7	1	34
26/10	5	5	2	3	3	5	1	24
27/10	5	6	4	6	5	8	3	37
28/10	4	2	2	3	4	6	2	23
31/10	7	4	3	5	6	11	2	38
1/11	6	5	4	6	6	7	3	37
2/11	5	7	2	4	5	5	4	32
3/11	7	6	2	7	4	8	3	37
4/11	8	6	2	4	5	10	2	37
	103	**105**	56	98	99	**142**	49	**652**

For the purpose of the study, the children's interaction while working at a computer include a wide range of social skills, such as sharing ideas with peers, working cooperatively, speaking or signing to a peer, taking turns at the computer and moving to improve his or her view of the monitor without interfering with others will be discussed. When children are working together, they are more likely to ask their peer than a teacher for help (Clements, 1994; Haugland & Wright, 1997).

These interactions are described in detailed in the following sections. Individual children's interactions are also discussed as related to the above pattern.

6.3.5.1.Finding 1: Analysis in pair

Table 6.3-6 presents a brief qualitative description of children social interactions patterns when working in pairs on one computer.

As indicated in Table 6.3-6, pairs who simply shared the computer with serial turn taking and exhibiting rich collaborative interactions without conflict whilst sharing the computer were pairs 1 2, 5, and 6. They exhibited behaviours like helping each other, sharing and exchanging ideas.

Table 6.3-6: Social Interaction Patterns when working in Pairs on one computer.

Pairs	Social interactions
Pair 1 Afifi (b) and Nusrat (g) (Field notes, 21/10/2005)	Sharing the computer was as easy for them as playing with other materials. Usually Afifi attempted to initiate new programmes and often helps and gives direction to Nusrat on what to do or how to do a certain programme. Nusrat usually followed Afifi's directions. They frequently talk to each other and exhibit peer social interactions within the pair; they exhibited behaviours like helping each other, exchanging ideas, or explaining to each other.
Pair 2 Wani (g) and Athirah (g) (Field notes, 13/10/2005)	Most of the time they played with the same software and the same activities that involved shared interests, such as drawing and painting. They interact well together without a conflict in sharing and experimenting with the computer. Wani and Athirah were uninterested in deep exploration, they simply returned to their familiar "favourite" programme. Among the pairs, both of them exhibited the most positive peer interactions.
Pair 3 Zaidi (b) and Azhar (b).	In contrast, Zaidi and Azhar, who worked very well together in other activities in playroom, experienced

(Field notes, 24/10/2005)	constant conflict when sharing their computer in the computer centre, they seldom worked together exploring and doing activities (e.g., drawing a map on the computer, or exploring new software programmes). Both of them appear have a higher level of computer abilities compared to other children. Their skills in using the computer show in their drawings which were very well formed and rich.
Pair 4 Lan (b) and Luqman (b) (Field notes, 14/10/2005)	Most of the time Lan controlled the computer. Often, Luqman sat next to Lan, looking at the computer screen and observing what he was doing. Although they always sat side by side, little interaction occurred between them. They seldom exhibited behaviours like helping each other, sharing or exchanging ideas.
Pair 5 Dina (g) and Ani (g) (Field notes, 14/10/2005)	Sharing the computer was as easy for them as playing with other materials, tools and toys. Usually Dina attempted to initiate new programmes and often teaching Ani what to do and how to do it. In contrast, Ani was more interested in clicking and moving on to the next image. They frequently exhibited behaviour like sharing and helping each other. They enjoyed animating on the screen. Ani's behaviour often seemed to frustrate Dina, and giving her brief suggestions (e.g., "Click the other one. You have to name it") and waiting for her turn to play. Sometimes, boredom with her partner might have contributed to Dina's leaving the computer centre before the end of the programme.
Pair 6 Yati (g) and Tina (g) (Field notes, 18/10/2005)	They played and interacted well together without conflict, sharing and experimenting with the computer, both frequently initiating new explorations. When Yati taught Tina what to do or how to do it, Tina followed Yati's directions. Yati always dominated, giving verbal directions to her partner as her partner played with and explored the programme. Both of them took balanced turns without conflict as they shared the computer during the free playtime each day. Their peer interactions were consistently exploratory and

	experimental.
Pair 7 Zaki (b) and Zaid (b) (Field notes, 31/10/2005)	They preferred to play the computer by themselves, seldom working together. When both computers were available, they usually worked on the computers individually. They often interact with each other but Zaki enjoyed working with adults (assistant teachers), he engaged in frequent interaction with the teachers who assisted his enquiries. He also enjoyed sharing and showing what he had newly discovered with the adults by playing with the computer and new software.

Note: (b)=boy (g)=girl

In the case of pair 3, the two children experienced conflict sharing the computer. They seldom exhibited behaviours like helping each other or sharing and exchanging ideas. In the case of pair 4 and 7, the pairs experienced no conflict sharing the computer in terms of serial turn taking but exhibited limited interactions between them and in case of pair 7, they prefer to play on the computer by themselves rather then sharing. Zaki for example enjoyed teaching or showing his discoveries to others:

> Zaki: (As he explored the Golden Books Encyclopedia for Kids, listening to the story with some background music, he was excited. He gave his headphones to Lan to enjoy the music, too.) Listen to this! I found it out.
>
> Zaki: (Saying to one of the teachers) Do you know the pyramid? You need to listen to this. It tells you everything. This programme has real cool music too! (that goes with the exploration of the pyramid)! I can still hear it in my mind!
>
> (Field note, 19/10/2005)

According to Crook (1998), Zaki's self-initiated social behaviour of letting others know what he knows seemed to contribute to his continuous improvement in computer use. The following findings detail the children's peer social interaction with peers at the computer centre.

It is important to note that, the children discussed in these findings did not play with the same peers during the whole observation period.

The following section presents the Social Interaction patterns when working in pairs on one or two computers at the same time.

6.3.5.2. Finding 2: Directing and Tutoring

"Works cooperatively (Directing and Tutoring) if two or more children are at the computer" was the most frequently observed form of cooperative behaviour. In this type of cooperation, one child would help another child to engage in the play by directing and tutoring. In one example, Azhar (the operator) has a little trouble positioning the icons in the right place. Zaki (the watcher) wanted him to move the icon up a little bit. However, Azhar either moves too high or too low. Zaki then assists Azhar, moving the mouse and dragging the icon to the right place (Field note, 12/10/2005)

Azhar and Zaki (12/10/2005)

> Zaki: Up..up..no...no..down..down (Puts his hand on Azhar's hand that was holding the mouse and moves the mouse around)
>
> Azhar: Wow!
>
> Zaki: This should go up a little bit (Put his hand on Azhar's hand again and helps him move the icon)

The following is an excerpt showing how Tina directed and tutored Wani on the computer screen. Tina directed Wani to do what she wanted to do. Wani was on the main menu of the programme and was considering which game she would be playing next. Tina directed her to play.

Tina and Wani (10/10/2005)

> Wani: (Moves the mouse cursor and sees which games she should pick up)
>
> Tina: This one, no.....this one...no....this one. (Asks Wani to move the cursor around according to her finger direction)
>
> Tina: Ok, let's do this one. (The mouse cursor was stopped on the matching game).

Wani: (Clicks the door of games as Tina instructed)

In another case directing occurred when one child ordered the other child to do what she or he wanted to do. The following example illustrated how Lan (the watcher) directed Luqman (the operator) to do what he wants to do with the programme.

The following is the example of working cooperatively (directing) when Lan and Luqman were playing a memory game. (Field notes 2/11/2005)

Lan: Ok this one and this one are the match. (Points to the screen) Trust me.

(Luqman clicks one hidden object)

Lan: The other one is here. (Points to the screen)

Luqman: It should be this one. (Uses his mouse cursor pointing the object).

Lan: No, not that one. You should click this one.

Luqman: Yes you are right!

Sometimes, directing was in the form of two-way communication. The operator followed the watcher's direction, and the watcher kept asking questions to clarify. However, just as often, the operator would simply ignore the watcher's orders.

Ani and Lan (2/11/2006)

Tutoring was observed when one child helped the other child to engage in the computer programme. The interaction between the operator and the watcher was didactic and two-way. For example, Ani wanted to find a surprise hiding somewhere on the programme but just could not find the way. Lan taught Ani step-by-step how to accomplish the task that Ani wanted to perform.

Children also work cooperatively (directing and tutoring) when they have a similar interest. From the observations, I noticed that the children exhibited a unique style of interaction as they worked together with pairs and have a similar interest (e.g., playing with the same software programme). They worked very well when they shared the computer. The following two examples showed the children's conversation working cooperatively (directing and tutoring each other) in front of the computer when they have a similar interest.

Wani and Athirah (2/11/2006)

> Wani and Athirah were observed working cooperatively as they have a similar interest.
>
> Athirah: We need to draw a couple of fish.
>
> Wani: Put them in a one group.
>
> Athirah: What should we call it? Let's call it 'Gold fish' (Ikan emas).'
>
> Wani: Let's call it whatever we want in our folder.
>
> Athirah: I'll call it 'Ikan Emas.'
>
> Wani: Save it in your head. So that we will use the name when we save the drawing into the electronic file.

Most of the time Wani and Athirah played with the same software engaging in the same kind of activity. They shared similar interests, such as drawing or finding mermaids, which they enjoyed animating on the screen. Wani, who exhibited proficiency more advanced than Athirah, taught her peer to use mental tools (categorical and memory-storing thinking skills) as a strategy. This is a good example of Vygotsky's (1978) notion of collaboration with more capable peers (p. 86).

Directing and tutoring also occurred when two children were observed planning how to make the game work. The following is an example of directing and tutoring when Zaid play with Afifi on the computer.

Zaid and Afifi (21/10/2005)

> Zaid : You know what, these two bricks are put too low for the Princess to step on.

Afifi : (Nodding her head and carefully dragging up the one of the icons Zaid mentioned)

Zaid : This minus icon, too.

Afifi : (Carefully moves the minus icon up)

Zaid : (Ok, then let's move the Princess up to where she can step on the tricks (pointing to the screen).

Afifi : (Following Zaid's direction)

Zaid: Ok.

Afifi : Ha, see, the Princess is getting smaller.

6.3.5.3. Finding 3: Ask questions and explain to another child

"Ask questions and explain to another child" was the most frequently observed form of cooperative behaviour. Asking questions occurred when a child with less computer competence asks the child with more computer competence how to make the programme work. In this type of social interaction, one child helped the other child engage in the computer programme. The interaction between both of them was didactic and two way. For example, Luqman wanted to find a surprise hiding somewhere in the programme but just could not find the way. Zaidi (next child) taught Luqman step by step how to accomplish the task that Luqman wanted to perform.

(Field note 28/10/2005)

In another case, the child (Zaki) with greater computer competence demonstrates to a child (Nusrat) with less computer competence how to make the programme work. Nusrat was trying to drag the watermelon into the basket, but the watermelon just kept dropping out of the basket. Zaki verbally instructed her by saying, "Hold the mouse", "ok, let's go," but Nusrat was still having trouble with dragging the watermelon to the right place. Zaki said "Let me do this," then took the mouse from Nusrat and showed him how to do it. (Field note, 13/10/2005)

From the observations, I noticed that the children fluently asked questions and naturally assisted one another in the computer environment. In certain situations, the children's conversation showed a sense of self-confidence as shown in the following three examples:

Dina and Zaidi (Field note, 11/10/2005)

Dina: Which way should I go, Zaidi?

Zaidi: You go south and I'm going around in circles.

Dina: How do you save it? (Dina wants to save her map picture in her electronic folder.)

Zaidi: I can help you. Go to Save. Go to your folder. Then, go to the box. Put in the name. Type it. And click save.

Dina: I know how to do it NOW!

In another situation Luqman asked Lan how to change the font size.

Luqman and Lan (Field note, 4/10/2005)

Luqman: I want to make it small (Point at the font)

Lan: Ok, let me show you! (Showing Luqman how to change font and font size) See, you can change the words like this! (By clicking on different font lists and numbers for different sizes)

Luqman:I wrote my phone number 4766601 (He typed his home phone number with font size 48). It's great!

Azhar and Zaidi (Field note, 24/10/2005).

Azhar: I don't know how to shut down.

Zaidi: (Approaching Azhar, pointing to the X box-exit button-on the top corner of the right side on the screen.) Click this!

Afifi and Nusrat (Field note, 21/10/2005)

Afifi: Make it bigger.

Nusrat: (Made the screen bigger, dragging down the cursor from the top to the bottom right side of the dotted box) that's cool!

Aififi: Now play.

Nusrat: (Following Aififi's direction, clicked on a play button) Oh! Ha, ha! Look!

Aififi: Go to the eraser. Can we make it bigger? I need to try, Nusrat.

Nusrat: (Gave the mouse to Afifi without hesitation, waited for 2 minutes watching Afifi playing) Can I have my turn now?

Aififi: (Gave the mouse to Nusrat without any hesitation)

Nusrat: There is a lot of stuff we can do on the computer together. We like to draw together.

Teacher: How did you know you could erase the picture?

Nusrat: We tried it out.

They played and interacted well together without conflict, sharing and experimenting with the computer, both frequently initiating explorations. When Aififi taught Nusrat what to do or how to do it Nusrat followed Aififi's directions. Often, they exhibited peer-teaching behaviours and Aififi dominated, giving verbal directions to his partner as his partner played with and explored the programme. Both of them took balanced turns without conflict as they shared the computer during the free playtime each day. Their peer dynamics were consistently exploratory and experimental. I noticed here, most of the time Afifi dominated the computer and Nusrat act as a watcher.

6.3.5.4. Finding 4: Speaks or signs to a peer

"Speaks or signs to a peer" at the computer was the second most frequently used form of social interaction with peers. Similar to works cooperatively if two or more children are at the computer, the watcher would tell or demonstrate to the operator how to perform the programme. In the following example, Afifi (the watcher) verbally assisted Dina to perform the programme, but Dina failed to do it right. So Afifi took the mouse from Dina and did it for her.

Afifi and Dina (Field notes, 17/10/2005)

Aififi: Click...hold it.... and move it up a little bit...click....

(Dina failed to do it correctly)

Afifi: Let me try it (Dina gives the mouse to Afifi)

(Afifi holds the mouse and demonstrates for Dina)

6.3.5.5. Finding 5: Explain to another child how a device or programme works

"Explain to another child how a device or programme works" was the fourth most frequently occurring form of social interaction behaviour in the computer learning environment. Most of the time, explaining occurred when a child with higher computer competence demonstrates to a child with less computer competence how to make the programme work. Explaining behaviour was usually followed by the assisting behaviour.

Zaidi and Ani (Field note, 2/11/2005)

Zaidi: Let's put the juggler on this horse and this one (The Prince) rides this horse. Then we can enlarge them afterwards and make them go to hit the wall. We can also put the spring foot in front of them and make them jump.

Ani: (Clicks the Juggler and puts him on the horse, then clicks the Prince and puts him on the horse)

Zaidi: Ok, put the magnifier here (points to the screen).

Zaidi: Yes, then put the sprint foot there.

Ani: What happened? Minimise?

Zaidi: It's all your fault! Let me show you how to maximise! (He clicks the maximise icon on the screen)

6.3.5.6. Finding 6: Share ideas with peers

"Sharing ideas with peers" was also found to be a frequently occurring form of social interactive behaviour in the computer learning environment, accounting for approximately (14.8%) of social interaction behaviour. In this type of social interaction, one child will share an idea with a peer. The following example illustrates how Lan (the watcher) shared ideas with Zaidi (the operator) about what to do with the programme:

(Zaidi and Lan, 11/10/2005)

Zaidi is adding to his illustration of the little pig's house on screen.

Zaidi: Lan, come here, I went over here on the lines and it won't work right now, can you help me?

Lan: Just draw what you like and then when you're done, we can do the lines over in yellow.

Zaidi:Can you help me, Lan? ... OHH! I did it on the grass.

Lan: TRY TO NOT do it on the grass!

Zaidi: I can erase it ... Lan would you help me? I like scribbling.

Lan:Yah, but you're not supposed to scribble. If you're going to start goofing, we're not going to let you do it.

Sharing ideas with peers also occurred when two children had different opinions on a certain issue or one was asking to take a turn. For example Yati failed to position the icon in a right place. Tina asked Yati to drag the icon up a little bit, but Yati refused. Tina explained to Yati what the consequences would be if she didn't drag the icon up.

Tina and Yati (1/11/2005)

Tina: Up..up..drag this up a little bit (helping Yati drag the icon)

Yati: No, that's not right.

Tina: This one should be up a little bit (Points to the screen)

Yati: No, no, that's not right!

Tina: (Looks a little upset) if you click this one, you need to start it over again. Oh...you did it wrong...Put this one here...!

Yati: (Moves the icon up as Tina said)

Tina: (Smiling...) Ok. That's good.

The following is an excerpt on how Zaidi and Zaid shared the ideas when playing with the maze game.

Zaid: Ok, what do I do now?

Zadi: (Looks at the screen for a while). Oh, I know. The fire should stay away from the water; otherwise, it will be extinguished. Let me teach you. (Tries to take the mouse from Zaid, but Zaid doesn't let him).

Zaid: Should I move it to the right?

Zaidi: I don't think so. Don't go to the corner. Stay away from water...hurry!

(Zaid has the fire caught by the water).

Zaidi: You are dead. Then you know how to play next one?

In the next game they were pre-planning on how to come out from the maze safely before starting the game.

Zaidi and Zaid (Field notes, 13/10/2005)

Zaidi: This angel can't be caught by the net. (Uses his finger pointing to the angel and net.

Zaid: I know, and where should we exit?

Zaidi: By the way, we should stay away from the shark too. (Keeps looking at the screen and didn't reply to Zaid's question)

Zaid: We should exit from here! (Points to the flower exit)

Zaidi: Yes!

(Zaid then start to play).

6.3.5.7. Finding 7: Takes turns

"Takes turn at the computer" behaviour was the sixth most frequently used social interaction behaviour in the open-ended computer environment.

> Azhar plays with the Darby and the Dragon game. A few minutes later, Zaidi comes and starts to watch him. Azhar asks, "Hey Zaidi, do you know how to find it?" While pointing at the picture on the screen, Zaidi says, "Click over here. Up Azhar." After doing that, Azhar asks again, "Where do I go now?" Zaidi points at the screen. "Go up over there." He does that and asks again, "How do I get that clue?" Zaidi says, "This way Azhar."
>
> When they both were playing, Tina ran to the computer area. Tina says, "Hey Darby the Dargon." While they were watching the game, Tina anxiously points at the screen to lead him. Azhar prefers to follow Zaidi's lead rather than Tina's. Tina gets overly excited and grabs the mouse from Azhar. He says, "I didn't finish this game." Watching them from distance, one of the teachers says, "Tina, its Azhar's turn. Wait for him." Tina stops interrupting Azhar .
>
> (Field notes, 24/10/2005)

In this episode, the children shared one computer and in doing so, they needed to interact with one another. They learned the rules of the games from each other, as well as learning about the responsibility of sharing and turn taking while playing in the computer area.

6.3.5.8. Findings 8: Conflict with peers

Table 6.3-7 illustrates the frequency of the four subcategories of unfriendly behaviour occurring each day of observation period.

Table 6.3-7: Child demonstrates unfriendly behaviour toward peers in the computer area.

Dates	Monopolises computer	Child frowns, hits, or pushes to gain or maintain computer	Pushes peer away	Manipulates, controls, directs others	Total
10/10	1	-	-	1	2
11/10	1	1	1	-	3
12/10	-	-	-	1	1
13/10	2	-	-	-	2
14/10	-	-	-	1	1
17/10	-	-	-	-	0
18/10	1	-	-	1	2
19/10	2	-	-	1	3
20/10	-	-	-	-	0
21/10	1	-	-	1	2
24/10	-	-	-	-	0
25/10	-	-	-	-	0
26/10	1	-	-	-	1
27/10	-	-	-	-	0
28/10	-	-	-	-	0
31/10	1	-	-	1	2
1/11	-	-	-	-	0
2/11	-	-	-	-	0
3/11	-	-	-	1	1
4/11	-	-	-	1	0

Over the course of the study, there were only twenty (20) occurrences of children's unfriendly behaviour toward peers during computer use. Three occurrences of children's unfriendly behaviour were observed on 11/10/2005 and 19/10/2005 each day. On the other days, two or less unfriendly behaviours were observed. For each subcategory, an excerpt of children's conversation is provided to understand better the nature of each type of social interactions.

The following example demonstrates how challenging and counter challenging sometimes involve conflict and disagreement. Three children are discussing how to create and put the button at the best place.

Zaidi, Lan and Ali (field note,11/10/2005)

Zaidi: (Lan is stretching across Zaidi to use the mouse). We have to put the right button on the right place.

Dina: Put here! That'll make much better (points to the screen)

Lan: No, I don't want!

Zaidi: Opp!.Click that button now (puts his hand over Lan to get the mouse)...no..no put here!

Lan:(release mouse), No, that is not the right place. Put it at the top (points to the screen)

Dina: At the top (Zaidi tries to talk over Dina)

Zaidi: (Makes a noise)

Lan: No it doesn't look good!

Zaidi: Then put it in the other layer

Lan: Look (tries to take mouse to show Zaidi but Zaidi grabs mouse away)

Zaidi: (shouts) Fine, I understand what you want. Alright, just stop it! (push Lan's hand away)

Dina: (looks at Zaidi) Zaidi!

Zaidi: I'm not having a fit-you are (looks at Dina). Alright? Just leave me alone (shout loudly and aggressively)

Dina: you are not letting us help.

Lan: Exactly- you think you are like the "master" (uses fingers to show quotation marks)

Zaidi: I'm not the "master" (looks at Lan and imitates his finger movement.

Teacher calls them away to break up the argument.

Here three children discuss how best to display the button. Lan and Dina suggest that Zaidi should move the button to the top of the front cover, but when this was done Lan does not like it. Zaidi then makes suggestions and when Lan tries to take the mouse to show how this can be done, Zaidi gets upset. From thee observations, I noticed that Zaidi dominates the group. He always sits in the middle, uses the mouse and does the necessary typing. He is reluctant to let go of the mouse, and Lan has to stretch across to use it. Lan and Dina want to help but Zaidi wants to control the use of the mouse. Positive interdependence is clearly not evident here, since Zaidi does not want his friends' (Dina and Lan) contributions. Cooperation is limited by aggressive and loud speech and lack of resource sharing.

Another conflict was found when taking turns on typing as shown in this extract where three children Yati, Azhar and Luqman played on one computer. Yati has been sitting in the middle doing the typing and Azhar is using the mouse. Azhar wants to do the typing, but Luqman who has already had a turn at typing, is persistent and gets him to acquiesce.

Azhar, Luqman and Yati (Field note, 19/10/2005)

Azhar: You want me to go in the middle (asks Luqman)

Luqman: (Reaches over Azhar to use the mouse). Let me go in the middle.

Azhar: I'll go in the middle.

Luqman: No, let me.

Azhar: Okay, then you can. You want to go in the middle (Reluctantly and slowly gets up from chair to swap seats.)

6.3.6. Theme 6-Children's Social Interactions with Teachers

From the observation and interviews I noticed that all the teachers constantly observed and became involved in the children activities in computer area. They spent considerable time with the children in the computer area and helped the children to solve their conflicts, encouraged them with verbal praises and asked questions. (Field note, 13/10/2005).

From the classroom observations it was obvious that all the teachers spent a considerable amount of time in the computer area interacting and assisting the children who were playing on the computer. (Field note, 18/10/2005). The estimated time spent by the teachers in this area is shown in table 6.3-8.

Table 6.3-8: Teachers' Times Spent in Computer Area

Dates	Minutes
11//10/2005	30
12/10/2005	55
14/10/2005	25
18/10/2005	40
20/10/2005	20
21/10/2005	45
24/10/2005	45
26/10/2005	25
27/10/2005	25
31/10/2005	40
2/11/2005	35
3/11/2005	45

The results from the table 6.3-8 clearly display the differences in teachers' (Jamilah and Ayuni) time spent in computer area in four weeks observation on different days. As indicated in the table 6.3-8, from the total of 12 days, during which the teachers spent time in the computer area, they spent less than thirty minutes in the computer area on only three days. The other eight days, the teacher spent less than 20 minutes in the computer area. They provided enough time to interact with the children while the children used the computer and they provided quality child-teacher interactions by scaffolding children's use of computers. The teachers played an important role in this classroom's computer use. Klein, Gal & Darom (2000) reported that teachers guidance behaviours such as focusing, affecting, expanding, encouraging and regulating, facilitated informed use of computer technologies and had positive effects on children's cognitive performance.

Additionally keeping an eye on children at the computer provides the teacher with additional information. For example, one teacher revealed that by watching her children at the computer frequently, she found that those who were socially immature became quite competent at taking turns. In addition, those who possessed poor social skills tended to verbalise frustrations and kept calm when they were upset with a peer. (Interview with Jamilah, 1/11/2005)

Another teacher noted, "I have also observed children's social interactions. Those who are quieter or more withdrawn, but are familiar with computer software, are a great benefit to others who are more outgoing and active. I have seen a decided improvement in shy children's self esteem when they are put in the leadership role of helping other friends. I have found that the quiet and affectionate children, who tend to be reluctant to approach others for play, are quite likely to offer help to less skilled classmates at the computer. I also have seen the more outgoing, active and verbal children become more subdued as they listen carefully to their friend's instructions." (Interview with Ayuni, 31/10/2005)

While some teachers recognise the importance of observation and spent a considerable time with children at computer centre, there are still concerns regarding this issue. Due to a large class size and with so many children to attend to, a teacher may not be able to closely watch children at computers. One teacher said, "I'll be honest; sometimes, I can't sit at the computer and interact with the children. Sometimes, I have to observe from afar and check in periodically." (Interview with Jamilah, 31/10/2005). The viewpoint also represents that of many others. What is suggested is that the teacher needs to be aware of the fact that children at computers deserve the attention of a knowledgeable adult. The teacher is uniquely qualified to provide this assistance by appropriately providing a scaffold for children's learning, thus fostering their growth and development.

Leaving children completely alone at the computer is developmentally inappropriate and may result in the absence of the benefits of computer use. In addition, children may feel that interacting with the computer does not matter very much to the teacher and that working with the computer is relatively insignificant. The computer may seem to be diminished in the child's eyes. According to Bredekamp & Copple, 1997), observation highlights children's interests, needs, and rights, providing a secure base that promotes children's curiosity and desire to learn

Table 6.3-9 illustrates the frequency of five subcategories of teacher-child interactions behaviour occurring each day of the observation period. Over the course of the study, there were 169 occurrences of children's social interaction with teachers during computer use. On certain days more interactions between children were observed than on other days. More interactions were observed on 11/10, 28/10, 1/11 and 2/11. Within the teacher-child interactions behaviour, "follows rules or directions given by an adult" (69 times) was the most commonly used form of teacher-child interactions behaviour in the computer centre accounting for approximately 40.8% of interactions. "Explains the problem to an adult for help" (56 times) was found to be the second most frequently observed form of teacher-child interaction behaviour. "Communicates a process to an adult" was the third most frequently used form of teacher-child interaction behaviour (16 times) and was followed by "Can state at least one rule for using the computer when asked" (15 times) and "Express enthusiasm verbally to an adult" (13 times).

Table 6.3-9: Child-Teacher Interactions

The Child can:

Date	State at least One rule for using the computer when asked	Explain the problem to an adult for help	Follow rules or directions given by an adult	Communicate a process to an adult	Express enthusiasm verbally to an adult	Total
10/10	1	4	2	0	1	8
11/10	2	3	3	1	2	11
12/10	1	4	4	1	0	10
13/10	0	4	2	1	0	7
14/10	1	3	5	1	1	10
17/10	0	3	3	0	1	7
18/10	1	2	3	1	1	8
19/10	0	3	4	1	0	8
20/10	1	2	3	2	0	8
21/10	0	4	4	0	0	8
24/10	0	2	3	1	2	8
25/10	1	2	2	1	1	7
26/10	1	3	3	2	0	9
27/10	0	2	2	0	0	4
28/10	1	3	5	1	1	11
31/10	2	2	4	1	1	10
1/11	1	3	3	0	0	7
2/11	1	3	6	1	0	11
3/11	0	2	4	0	1	7
4/11	1	2	4	1	1	9
	15	56	69	16	13	169

The following findings detail the children's peer social interaction with teachers at the computer centre.

From the observation, I noticed that most of the time the teachers helped children fix basic computer problems such as inserting or ejecting software disks. They frequently sat with the children in the computer centre during their play. When they were not available for sitting, they constantly observed children who were in the centre. Sometimes they became involved in children's computer play by asking questions, giving directions or by praising the children. (Field note, 14/10, 18/10, 20/10, 27/10, 28/10, 2/11).

All the teachers said that they would help the children when they had technical problems with the computer. In this classroom, the children are not allowed to turn computer on or off. The teacher will try to fix all the technical problems, such as a frozen screen, unable to open the CD device and so on.

In some instances, children would openly ask the teacher for help, usually concerning how to perform a certain task on the computer.

> "Teacher, can you help me?" Tina asks the teacher. "I want to use a different programme." The teacher moves the mouse and clicks the button. Tina takes over again and begins using the typing programme. (Field note, 1/11/2005)

The foremost problem was that computers and software in the classroom constantly got broken because the children used them carelessly. The children often needed assistance while playing with the computers. However such assistance was only available when they asked for it.

The following is an example of the teacher social interactions when they help the child:

Yati moves the mouse around and clicks on the paint programme. The teacher says,

> "Do you want to mix paint colours?" Yati said "yes", and the teacher helps her move the mouse and clicks the icon. (Field note, 3/11/2005)

The following example illustrated how the teacher (Ayuni) directed Azhar to do what he wants to do with the programme.

> Teacher: Let's pick the Prince and put the Prince next to here (pointing to the several spots on the screen repeatedly)
>
> Azhar: Here?
>
> Teacher: Yes, right there. Then, you click the Prince, and put him next to the princess. (Ayuni points to the princess on the screen).

Azhar: Is this a Prince?

Teacher: Yes, then put him right here (pointing to one spot on the screen).

Teacher: Ok, you can click the green light.

(Field note 27/10/2005)

Sometimes, directing was in the form of two-way communication. The children followed the teacher's direction, and the teacher kept asking questions to clarify.

In the following example, teacher (Jamilah) helped Tina catch the right object dropping from the top.

Teacher: You can only use these two things. (Points to the screen)

Tina: (Looks where the teacher pointed at).

Teacher: No, don't catch the apple.

Tina : Sure I can.....Oh, you are right!

Teacher: Here comes the ice cream, you can catch it.

(Field note, 18/10/2005)

The analysis of the observations of teacher-child interactions in computer environments revealed that children who operated computers with teacher's guided instruction improved their computer operation strategies, from trial and error to planning ahead, as apposed to children who operated computers without such instructions. The trial-and-error strategy was frequently used by the children without teacher guided instructions. They tended to respond immediately to the programme task, and make many mistakes. The children who chose to followed the teacher's direction or help delay their reaction in order to think before they click the mouse button, resulting in more correct reactions. (Field note, 14/10, 18/10, 20/10, 27/10, 28/10, 2/11).

The interactions between teachers and children also occurred in conflict situations. In this situation the teacher will help the children when they have conflicts with peers and also help them when they have difficulties when playing games. For example: most of the conflicts observed in this study relate to turn-taking and use. One of the children Nusrat was repeatedly denied use of the computer by his peers. This constant rejection by his peers may discourage Nusrat from working with others on the computer, and also may discourage her from using the computer. In this case, the teacher frequently solved the problem in the computer centre. According to Nusrat, "I don't like being push". (Interview with Nusrat 22/10/2005)

Afifi and Azhar (21/10/ 2005)

> Afifi opens the typing programme. He presses a few buttons and Azhar looks over at his screen. Afifi quits but then reopens the paint programme. Azhar reaches over and presses some keys on Afifi's keyboard. He moves his arm to try and block him, but Azhar keeps trying to interfere with him. "STOP!" says Afifi. Azhar goes back to his computer. (Field notes, 18 September 2005)

Wani, Lan and Azhar (13/ October 2005)

Wani comes over and wants to use the computer. The teacher says to Lan and Azhar'

> "Wani wants a turn now; which one of you wants to leave?" "He does", Lan says pointing to Azhar. They both continue using the computer. Suddenly, Lan pulls out Azhar's headphones from the computer. "What did you do that for?" Azhar yells at Lan. "Lan that was not okay," says the teacher. Lan continues clicking on screens.
>
> "One of you needs to let Wani have a turn," the teacher says again. This time Azhar points at Lan to get up. The teacher asks Wani, "Which computer do you want to use?" She points to Lan's computer and Lan gets up. Wani sits down at the computer that Lan was using and puts the headphones on.

Dina and Afifi, Zaid and Ayuni (The teachers) (10/10/2005)

Dina and Afifi were joined by Zaid at the computer table. While Zaid was using the mouse, Dina and Afifi watched him and pointed at the screen to lead him to the clues. After ten minutes, Zaid pressed the button on the keyboard to restart the game. Seeing the screen go off, Dina shouted with excitement, I play after you. I play after you." Instead of leaving, Zaid started playing the game from the beginning. Dina cried and told the teacher, Zaid did not give me a turn." The teacher asked Zaid to give a turn to Dina. Zaid left.

The teacher restarted the game for Dina, and Afifi came, and they played it together. While Afifi and Dina were playing, Azhar came to the computer table. Due to the lack of space, they started to push each other. Azhar made a lot of suggestions to Afifi by yelling and pointing at the screen. Several minutes later, Azhar left, and Afifi sat down on his chair. (Field note, 10/10/2005)

In the above example, the teachers were ready to solve the conflicts that happened to occur in the computer area.

All the teachers frequently solve the problems in the computer centre; sometimes the conflict would be the children fighting over a turn, or sometimes it would be a child needing directions for the software.

Azhar, Yati and Zaid (31/11/2005)

Three children, Azhar, Yati and Zaid are playing with the computer. Yati types her name as a part of the game and Azhar and Zaid yell, "That's wrong. That's wrong." They all start yelling at each other. The teacher (Jamilah) comes and tells them not to yell at each other. She sits with them and lets Yati type her name again. When she types it correctly she says, "You got it right, Yati". (Field note, 3/11/2005)

In another case, Luqman, a child and Ayuni a teacher, are playing with the computer. While pointing at the screen, Luqman asks, "How can I go there?" Ayuni says, "Move the mouse and click." Luqman cannot move the mouse to the right spot on the screen and gets frustrated. He says, "I don't want to play this." Ayuni suggests, "Let's change the game." She shows Luqman the software folder and they pick Darby the Dragon game. Ayuni inserts the game and starts it up for him. At the same time, Ani (the child) comes and asks Ayuni if she can play with the computer. Ayuni says, "You can play, but you have to wait for your turn. After Luqman." When the games start Anita asks, what do you want to be Luqman?" He says, "I want to be Darby." Ani interrupts, "I want to be sparkle." They talk and laugh while Luqman is playing. Although Luqman is clicking the mouse, he cannot find the right picture to click on in order to go to the next page. Ayuni put her hands on top of Luqman's and shows him how to move the mouse. (Field note, 31/10/2005).

In the above examples, the teachers, Jamilah and Ayuni were ready to mediate conflicts that happened to occur in the computer area. When one child was playing and others were watching, the children often interrupted each other verbally or physically. In these instances, Ayuni and Jamailah handle the matter through verbal warnings or reasoning methods. Additionally, some children were not capable of using the mouse efficiently or were having problems playing the game. The teachers helped these children by tutoring them

The teacher-child interaction is also considered as scaffolding. A brief example of scaffolding is shown below.

The teacher put her hand over the child's hand to slow the movement down while pointing to the cursor on the screen. With two or three brief sessions of teacher scaffolding and much watching of other children, most children seemed to have the concept of slow deliberate movement of the hand. They would then focus on the cursor specifically rather than the pictures on the screen and work very deliberately to get the cursor to the desired place. (Field note, 21/10/2005)

The interactions between teachers and children happened when monitoring or scaffolding the children in the computer centre. Sometimes the teachers will ask the children the questions, praising them, encouraging, and giving direction. Monitoring allows the teacher to know when to intervene and give children help and when to allow the children to discover things on their own. Most of the time these teachers let children work on their own. One of the teachers responded that, "Some children interact well with their peers. Those children I allow them to work independently. Other children those who did not interact well with peers, I try to help them and interact with them."(Interview with Jamilah, 25/10/2005).

Besides the role of teacher in scaffolding children's use of the computer, encouraging risk-taking and asking questions that challenge children's thinking was also found to be crucial and important in creating effective computer learning environments (Downes, Arthur & Beecher, 2000). Furthermore Klein, Gal & Darom (2000) reported that teachers' guidance behaviours such as focusing, affecting, expanding, encouraging and regulating, facilitated informed use of computer technologies and had positive effects on children's cognitive performance. And as part of the computer integration process, the teacher's role included being a tutor, coach, model; active teacher involvement is strongly recommended (Davis & Shade, 1994; Haugland & Wright, 1997; Hohmann, 1990).

Teacher (Ayuni) and child (Luqman and Zaidi) (14/10/2005)

Two children come to the computer area. They choose a game and one of the children sets it up on the computer. After the game starts, the first child clicks everywhere on the screen. One of the teachers says "Listen to what you need." The voice on the games leads the player to find and click the pictures on the right, left, under, above etc. The teacher says, "Did you see the picture on the right? Hit it," After the child clicks the right picture, the teacher says, "Good job!" Both of the children continue listening to the directions from the game and teacher plays with them for a while (Field note from 14/10/2005).

This episode exhibited teacher's scaffolding in the computer area. Through asking questions the teacher helped the children learn the rules of the game. The second time, the children were able to find the correct answer and move forward. The role of teachers in scaffolding children's use of computers through encouraging risk-taking and asking questions that challenge children's thinking was found to be crucial and important in creating effective computer learning environments (Downes, Arthur & Beecher, 2000). In these cases, the computer allowed teachers to make a uniform problem presentation while witnessing children's cognitive capabilities, listening to their metacognitive thoughts and offering alternative problem-solving approaches. The computer context also extended the teachers' power as adaptive tutors, allowing them to mediate between the child and the computer. Computers enable teachers to accommodate children's different learning styles and abilities.

In conclusion, the findings of teacher-child interactions can be divided into three categories; -

a) Interactions occurred when the teacher helps the children

b) Interactions occurred when the teacher solves the problems among the children

c) Interactions occurred when mentoring or tutoring

6.4. Conclusion

Findings of the current study indicated that teacher-child interactions often occur in relation to computer use. That is, for approximately half of the time that the children accessed computers, teachers were there observing and directing the activity. Although the role of adult interaction is important for the development of children to enhance their social interactions, cooperative use of technology with peers is recommended. However, the present research also demonstrated that the children frequently used the computers independently or with peers. (Field notes, 10/10/2005, 13/10/2005, 18/10/2005, 20/10/2005, 21/10/2005, 27/10/2005, 28/10/2005, 3/11/2005). This independent use of the computer may be related to the availability of the drill and practice software. Without an understanding of the varied benefits of computer use for young children, pre-school teachers may not realise that child directed activities may also be used. Yost (2001, 2002) offered a variety of approaches and activities that teachers can use to provide opportunities for child-directed activities and computers. By providing a variety of opportunities across the day for children's computer use, children learn to use the computer as a tool. As teachers seek mechanisms to support and extend children's learning, they should ask themselves how the computer can help. After a decade of studies, researchers are still asking if computers will change early childhood education (Haugland, 1995). I agree with Papert (1993) that computers cannot revolutionise the way children are taught unless teachers examine how they teach without computers. Educators must address the purpose, quality and social context of computer-instructional experiences for children.

> "The adult arouses care, curiosity and alertness in the child and helps the child to understand the activity so that they can be successful in it."
>
> (Sayedd and Guerin 2000:80)

Chapter 7: Findings For Case Study II, III and IV

7.1. Introduction

This chapter provides the findings of the children's social interactions in pre-school B, C and D and is thus based on the main themes that emerged from the discussions in chapter 6. The following are explained:

7.1.1. Theme 1: Computer facilities in the pre-school B, C and D classrooms

This section on computer facilities in the selected classroom is divided into three categories: a) Resources, including hardware, software and technical support, b) location and arrangement of the computer centre c) Equal access to the resources.

7.1.1.1. Resources and location of the computers for pre-school B, C and D

This section discusses the analyses of resources and location of the computers from the observations and teachers interviewed. Table 7.1-1 presents pseudonyms of the teachers who were interviewed in this study. All the teachers are female.

Table 7.1.1: Pseudonyms of teachers who were interviewed

Pre-school B	Pre-school C	Pre-school D
Masni	Kamariah	Mariam
Anita	Hanim	Sakinah

Table 7.1-2 presents a summary of the number of computers and supported peripherals in pre-schools B, C and D.In pre-school B, the computer centre is located in the teacher's office. In this room, two computers – (two windows 98 126Mb and 64 Mb) are placed on child-sized tables and arranged in a semi-circle position with four chairs. This classroom does not have any other peripherals except a printer. Appendix VI visually portrays Pre-school B's playroom and computer centre.

Table 7.1.2: Number of computers and supported peripherals in pre-schools B, C and D

Preschools	Number of computers	Supported peripherals
Pre-school B	Two computers (Window 98 126Mb and 64 Mb)	Printer
Pre-school C	Two computers (Window 98 126Mb and 64 Mb)	Printer and Internet connection in teacher's room.
Pre-school D	One computer (Window 98 126Mb)	Printer

According to pre-school B teachers,

> "There are limited places where we can put it. Power points is one big factor for us, we have only got a few power points around the room. It is located in an area that is not in the middle of other children's play and it had to be there because that is the only other place where there is a power point". (Interview with Masni, 3/5/2006)

She explained that

> "Where it is, it really annoys me that I can't take the computer out because there is limited power point in our classroom. For me, to be out of the room and take two children at a time, it means that my assistant is left with thirty two other children. Furthermore my assistant is completely illiterate with computers, well it becomes hard". (Interview with Masni, 3/5/2006)

She added that "Actually we have little control over decision-making regarding the positioning of the cabling, the positioning of computers in this class. I think this class needs to be scheduled which could create problems with access. In addition the close physical proximity of the computers caused problems with mobility and concentration." (Interview with Masni, 3/5/2006)

A desirable arrangement for the computers was defined as one that enabled children or teachers to see all the screens at once in order to encouraged helping and sharing among them (Hohmann, 1990; Haugland & Wright, 1997). Moreover, a display area inviting children to share their work and ideas was recommended as a part of the computer centre arrangement (Haugland & Wright, 1997).

In Pre-school C, they had a very simple computer area located in a sunny and large space by a window near the learning centre. Children could easily spot the area from a distance. The large computer area provides enough space for more than one child to play at a time. Appendix VI visually portrays Pre-school C's playroom and computer centre. They have two PC computers placed on a table by the window accompanied by three chairs, one for teacher and two for the children. There is also a file on the computer table where they keep track of children's activities. This classroom does not have any other peripherals, such as a printer, or a scanner, or an internet connection. However, in their own room, the teachers have a computer for their professional and personal use; it is connected to a printer and the internet. (Field Notes 12/5/2006)

According to Pre-school C's teacher,

> "We don't want it as a distraction, so we have it near quieter activity areas, in a little corner, so children aren't walking all around it and other children, so they are not distracted and it is usually in a quieter area, not like backing onto the block mat or something. However, it is not separate from other activity areas."(Interview with Kamariah, 11/5/2006)

In pre-school D, the computer centre is located against the back wall between the manipulative and the communication centres. When one first enters the classroom, one may have difficulty locating the computers because tables block the view. They have two PC computers placed on a table accompanied by three chairs, one for teacher and two for the children. The computers were placed on top of a child-size table so that the children could view the screen and operate the mouse independently. The children sat next to each other in two chairs facing the computer. Similar to preschool B, this classroom does not have any other peripherals except a printer. Appendix VI visually portrays Pre-school D's playroom and computer centre.

The location of the computer was defined by the need to provide the children with enough space to move around the computer. This decision was made with respect to the developmental needs of young children in a physical sense:

> "We decided to locate it on a wall to have the support and just in case the children were pushing and pulling cords and leads, making them very contained so we had the space, but also in a corner of the room where there was also lots of space around it, so room for chairs and pulling, plus if other children wanted to come and observe, so that was thought through." (Interview with Mariam, 18/5/2006)

The pre-school D teacher also expressed how she felt about this classroom computer arrangement.

> "The children have to share the computers. It was fantastic when we had 25 children last year, but now we have got 30-38 children and it's quite difficult". (Interview with Mariam, 18/5/2006)

These experiences with the computer meant that each of these teachers described the actual location of the computer in the classroom as an important factor to consider with respect to its integration in early childhood education. For all the teachers, although they have access to more than one computer, the location of the computer was still a factor requiring consideration in order to ensure that it was utilised effectively. The location of the computer in the actual room was of importance to the educators in terms of the children's learning. For teachers in pre-school B, this issue was of perhaps greater importance, since its location, in their offices, raised difficulties associated with the appropriate supervision of children. For the pre-schools with computers in their classroom there was a need to locate it in an area where the children would not be distracted by other children or teachers.

7.1.1.2. Software

Pre-school B teacher emphasised through the interview that she preferred non-violent, gender neutral, not intensively marketed software that also encourages children's thinking skills. (Interview with Anita, 4/5/2006).

The degree of interactivity enabled by a programme was not the sole consideration in relation to the selection of software, with issues associated with the age appropriateness of the programme also of importance. Here the teachers also noted that the activity enabled by the software needed to be appropriate to the children's abilities and levels of computer experience as mentioned by pre-school C teachers:

> "When choosing the software, the programme, you have to think about the age appropriateness, age appropriate programme that is what I would be thinking of, so with the software you have to explore the age appropriateness and the difficulties for the children" (Interview with Kamariah, 11/5/2006).

However, for pre-school D teachers' the selection of software was governed by a range of issues, in addition to age appropriateness, usability and the expression of gender stereotypes:

> "Basically the underlying philosophy and policy is that it has to be educationally valuable, and developmentally appropriate for that age. We have gone for stories, although that depends on the length of the story; we use pictorials, but we want them bright, clearly seen, with a bit of text depending on how long the child's concentration span is. Obviously, well it is obvious to us that there is no violence, no inappropriate language, I guess a balance of gender identity or representation". (Interview with Mariam, 17/5/2006).

Results of this study suggest that even when computers were available for young children in the selected pre-school classrooms, the implementation of the computers contrasted with the NAEYC's (1999) recommendations, as well as recommendations by Yelland (1999), for the proper integration of technology, which stated that play software must be available for young children. Findings from the current study, however, demonstrated that of the pre-school classroom B, C and D offered software primarily for drill and practice of basic skills. These results support previous research that software is more often used for drill and practice than for play (Judge, 2001).

Several possible explanations exist related to the lacked of software for play in child care settings. Although the issue may be a financial one for some child care centres, it is likely that childcare directors and/or early childhood teachers lack the training and expertise to design and set up a technology centre as well as the skills needed to evaluate and select developmentally appropriate software for play.

Finally, all the teachers mentioned that the technical aspect of the software such as whether or not the instructions are clear (hear and see) and the programme is easy to manoeuvre must be considered.

Another arrangement issue in the computer centre was the location of the software folder. In pre-school B, it was kept on the shelf far away from the computer centre. When the children wanted to reach the folder, they needed to walk to the main door from the back of the room. While walking such a distance, they were usually attracted by other activities and friends along the way. Then, they never came back to play with the computers (Field Notes, 2/5/06). When I asked one of the teachers about this, she explained:

> "Personally I don't know, it's always been like that since I have started" (Interviewed with Masni, 2/5/2006).

After discussing this, she had decided to talk about this issue at the staff meeting and would try to change the location of the software case.

In pre-school C, the teachers keep the software for the children. From the software collections the teachers select software each month that will be available to the children during that time. Those available for the month are kept in a plastic software case and the rest of them are kept in the teacher's room. This way each, software gets rotated every month. At the time of my observation the software available were: Get in fight, Ready for pre-school, Best activity centre, Jump start Baby, Elmo's Art Work Shop, Arthur's Ready Race and Dr. Seuss's ABC. (Field notes 12/5/2006).

In pre-school D, the software case was kept on the computer table so that the children could easily access the software collection. They also own a very limited amount of software, which was also mostly donated by parents. The children in this classroom only use the game programmes. Their collection includes: Thinking Things, Jump Start Kindergarten, Jump Start Pre-school, Little Bear Kindergarten, Darby the Dragon. All of the software is available for children at any time they want to play. Additionally, a computer log was kept to record the computer activities at the table by the teachers (Field Notes, 19/5/2005).

7.1.1.3. Equal access to the resources

In B's classroom, the children also accessed the computers during free playtime, which was one and half hours in the morning. Children played with the computers without any adult supervision only at those times. This classroom had certain rules in order to prevent overly crowded centres. They allowed only a certain number of children at one time for each centre. A maximum of four children were permitted to play at once with the computers. One of the teachers explained the rules of the computer centres:

> "We only allowed maximum four children at one time to play with the computer. If more than four children want to use at the computer the same time, we limit the time for each of the children for example 10 or 20 minutes for each child". (Interview with Masni, 5/5/2006)

In pre-school B, as mentioned above, the computer centre is frequently used during free play times. While playing with the computers, the children are entirely in charge of the equipment. They independently turn the computers on and off. Select, insert and eject the CD with which they want to play. The children are even allowed to go into the hard drive of the computer and change some settings, such as the screen saver or desktop background. In this classroom, the teachers had four nametag pads placed near the computers, meaning that only four children could play with the computers at one time. (Field notes, 5/5/2006)

According to Masni, computers were not a priority in the classroom. The children showed little interest in computers. Some days, nobody played with the computer. She gave the reasons for the lack of interest.

> "I think recently we had a lack of interest in the computers. I think it has a lot do with the fact that the teachers in this classroom are not really up to speed with the computers, so they do not know it is the CD or the computers having problem. So a lot of times children will get into the computer and will not able to play with the CD. So I think it is a lot of frustration we have in hand more than interest in the computer centre". (Interview with Masni, 5/5/2006)

Both classroom C and D also allowed children to play with the computer during free play times which was one and half hours in the morning. However, they were flexible about how children used the centre.. Kamariah explained:

> The children use it pretty much independently and spontaneously and play whatever software we have there.... we're not strictly ten minutes and you get ten minutes. But that sort of artificial time chopping is outside the teacher but let the children work it out (Interview with Kamariah, 12/5/2005).

In term of equal access, Kamariah emphasised her idea of sharing experiences. According to her, instead of waiting for somebody, children should share their play:

> "Instead of waiting for turns, I prefer that they share the computers. Sometimes when more than 3 children want to use the computers, I placed 2 or 3 chairs at each computer to let the children play together" Interview with Kamariah, 12/5/2006)

In Classroom C and D the teachers were very flexible about how much time the children spent at the centre. Similar to pre-school A, they allowed the children to stay at the centre as long as they wanted. The teacher's general policy at the computer area required adult assistance for the children while setting up the computer and the game. As a result of this adult assistance, their computer worked properly during the whole observation time. (Field note 12/5/2006 and 18/5/2006)

In pre-school C and D, all the teachers and assistants mainly observed them. Sometimes they engaged in conversations with each other or with the children who played in the learning centres. They also did small tasks; such as cutting paper for others' art activities, while the children were playing at the centres. (Field notes 12/5/2006 and 19/5/2006)

7.1.1.4. Technical support

Pre-school teacher B said that she has not got enough technical knowledge about computers and the internet. She said that she does not want to spend time learning it and she does not agree that a pre-school teacher should know technological things. According to Masni's thoughts, only the technical staff should care for the technical problems about the computers and the internet but there are no a technical staff in her classroom. (Interview with Masni, 4/5/2006)

Masni also highlighted that the classrooms need a computer assistant or somenone who could help them with computer problems. She acknowldged that she was not a high-tech person. Although she knew a little bit about computers and used computers for her own personal needs, such as word processors, she was not capable of troubleshooting of fixing the computer. She indicated that sometimes she asked for parents' help with the computer problems. (Interview with Masni, 5/5/2006)

Throughout the period of the case studies, there was no technical support at the pre-school B, C and D. The demand for the technical support was very critical for these pre-schools. As the computers provided always have problems, there was an increased demand for technical support.

Further evidence testifying to the reluctance of teachers to use technologies unless they are totally confident of their ability can be seen in the following comments from pre-school D teachers in the study.

> "I've just had the frustrations and thing that everybody else has had. Nice to have the computers in our class but, you know, I've typed up something and I can't print it out because the printer isn't connected, so then I write it out because I can't bothered for someone to come and fix up the connection for me".(Interview with Mariam, 18/5/2006)

> I've reverted to writing by hand (even though my handwriting is disgusting) because it doesn't break" (Interview with Mariam, 18/5/2006)

In addition, the frustration caused by computers 'freezing' or working too slowly was evident, with teacher in pre-school C describing this in terms of a 'lost' teaching moment:

> "You've got to have good computers, that's the other issue, because I remember going back, initially we had one computer that wasn't working very well and this was off site and it would take a long time to load and a long time to process and the learning moment had escaped it had gone, so it really also depends on your actual type of machine" (Interview with Kamariah, 11/5/2006)

During the whole observation time in pre-school C, the teacher placed "out of order" signs on the both of the computers 5 times to indicate that the computer was unavailable (Field note, 12/5/2006). Receiving technical support was a big challenge for this pre-school.

Mariam from pre-school D described her experience in using a computer that tended to shut down without an obvious reason. Eventually, it was simply considered easier to avoid using the computer at all:

> "We got a second hand one, which kept on shutting down all the time, which is another reason why I just gave it up, you need one that works properly." (Interview with Mariam, 18/5/2006)

Access to reliable and current technology would seem an obvious factor to consider when integrating computers in the early childhood classroom. However, in those situations where such technology is unavailable, it would appear that using a computer can become too frustrating to have educational worth. In these cases, the effective integration of a computer into the early childhood setting is one defined not some much by the presence of the computer itself, or even pedagogical concerns, as it is related to issues associated with resourcing, access and equity to appropriate educational materials (Wood, Willoughby & Specht, 1998).

7.1.2. Theme 2: Teacher's beliefs, views and knowledge about computers

Pre-school B teacher made reference to the computer in relation to the curriculum and the need for it to be included in the classroom in terms of technological currency:

> " I don't now how to put it (computer) as part of the our curriculum, but I saw it as important to keep up with computer technology and that is how I did see it, that we needed to keep up with modern technology, we needed to at least let the children have some sort of experience of the computer. I don't plan the computer in our daily activities, I don't have any expectations of the child, my one expectation is that they have the experience and also that they gain control of the mouse." (Interview with Masni, 4/5/2006)

For this teacher, the decision to use a computer was informed by the need to 'keep up with modern technology'.

The response from pre-school C's teacher regarding the decision on using computers in the pre-school classroom likewise emphasised the notion of technological literacy. The decision related more to skills acquisition than it was to an understanding of how it could effectively be integrated into the existing curriculum:

> "I feel that in this stage, it is enough if the children have the basic skills like mouse control, use the keyboard and know how to turn on and off. So when they entered primary one, they get prepared for it and that was one of the reasons why we encourage the children to use the computer. It's just to make it easier when they started school and they would be familiar with it and wouldn't be frightened. I think children are better prepared and a little bit more ready for it". (Interview with, Hanim, 12/5/2006).

According to this teacher, children require access to the computer in order to ensure that they have the skills necessary for its operation when they attend school. In this respect, technological currency was linked to operational need.

On the other hand Kamariah from pre-school C explained that,

> "I cannot imagine a classroom without a computer in it. It is never too early to expose pre-school children to the realm of technology that a computer offers" (Interview with Kamariah, 11/5/2006)

Similar to Kamariah's comment from pre-school C, Mariam from pre-school D said that,

> "There are a lot of reasons why we keep the computers in the classroom. One of them because the children seem to like it" (Interview with Mariam, 18/5/2006).

According to Mariam, having a computer in the classroom also could be especially helpful for children who did not have a computer at home. She considered computers as tools that contribute to children's confidence. She stated that,

> "Computers are good to build the children's confidence. It gives them confidence when they get on the computer, you know, confidence they didn't have for anything else. Now they'll go and try other things. They talk about things they never talked about before. The computer gives

> them something to be good at, something they can talk about and feel good about. They'll say, 'We saw that on the computer 'or 'we did that on the computer'. They can be the 'helper' to other students instead of always being the one who needs help. They have something to be proud of. The computer is helping them so much."(Interview with Mariam, 18/5/2006)

Similar to Mariam's beliefs, Sakinah also from pre-school D said,

> "By working on the computer they get the confidence to communicate. They are able to build friendships that they wouldn't be able to otherwise." (Interviewed with Sakinah, 18/5/2006).

Furthermore, she explained that:

> You know, for certain children in my classroom, it provides an area of confidence. For one of my students, it's an area of confidence. He has a problem with language, with speech communication. Now he has a particular syndrome and for him, he can be very successful using the computer. Umm...., so it's, for him it's a great theme builder. He actually ends up then using his language because other children ask him, how to do that? And so he became the expert in that area. So that's one area where I would say it's very good for children to have a competence with it (Interview with Sakinah, 18/5/2006)

Computers provide many opportunities for new learning activities. In entering the social context of the classroom, the question that arises for teachers who wish to incorporate technology effectively is—"how do computers assist students to learn?" In examining teachers' espoused beliefs, all the teachers' indicated that incorporating computer technology helps children to learn and that computers were as important as books. The teachers' responses to how computers can assist learning play a central role in how and whether computer becomes an integral part of the classroom.

All teachers from the pre-school B, C and D also believed that computers can assist children to learn, as expressed by Masni from Pre-school B. Masni believes computers used as 'mindtools' (Jonassen, 1996) can challenge students' thinking. According to Masni;

> "Good teaching with information communication technology can do so many different things for students...it can challenge them. For example the right software set up by a teacher who understands the potential, can

> take a student to a place they have never been before." (Interview with Masni, 4/5/2006)

This teacher's emphasis on programming to enhance thinking, confirms Papert's (1980) assertion that when a child learns to programme, the process of learning becomes more active and self-directed. This view is also supported by Natasi and Clements (1992) and Hoyles and Sutherland (1989) among others, who found that the programming environment resulted in more collaborative problem solving because it was a more complex task.

On the other hand, some teachers confirm their use as 'productivity tools' (Jonassen, 1996) because they can be used to produce more efficient ways of (re)producing work not as a different way of thinking.

> "It is a great learning tool, because it can engage the children so much more compare to paper or pencil activities would. I guess certainly the majority of software we have now in the market do engage children." (Interview with Kamariah, 12/5/2006)

From the above result of the interviews it is obvious that the all pre-school teachers think that children's self confidence can be increased through computers. This is in line with studies (Gustafsson et al., 1998; Gustafsson et al., 1999) where the teachers' experiences were that the children experienced success and happiness when they worked with the computer.

One of the teachers from Pre-school C was very enthusiastic about the benefits of using a computer in the pre-school classroom. She stated:

> "I think they (computers) help to develop positive attitudes in the children. They seem to love it and don't seem to have the same inhibitions as parents do." (Interview with Kamariah, 12/5/2006)

This teacher also considered that using computers with young children empowered them as they became more knowledgeable and in control of the technology. It helped to boost their confidence and self esteem. For example Kamariah from pre-school C explained:

"Sometimes it's like the children are teaching the teachers. The children get a real buzz out of showing us what they can do. The parents are also really impressed with the children." (Interview with Kamariah, 12/5/2006)

The teachers were also impressed with the way computers helped children to learn concepts such as shapes and colours and beginning literacy skills. As Hanim from pre-school C stated:

"The children learn to match objects and recognise lower and upper case letters. When using the computer, they also refine their skills of eye and hand coordination." (Interview with Hanim, 12/5/2006).

7.1.2.1. Barriers for computer use

Two teacher's in pre-school B stated that time is a limiting factor in the work with a computer in a pre-school setting since so much time is spent dealing with practical issues, for example, meals, helping the children dress, and bathroom routines (Interviewed with Masni and Anita, 4/5 and 5/5/2006).

Other explanations provided were the difficulty of getting enough time to sit and actually work with the computer. This is due to the fact that pre-school teachers cannot sit for long periods of time at the computer since they work in a team, with different schedules and large groups of children and have very little computer training. As Masni's explained,

"I think it is helpful to incorporate computers into the pre-school setting. But the demand for children to excel in their academic subject as.....we find hard. We don't have the enough time to really use computers in our teaching". (Interview with Masni,4/5/2006)

And according to Kamariah from pre-school C,

"Time management is the major problem. Also we are limited to one computer, and that is not enough for 40 children."(Interview with Kamariah, 11/5/2006)

Another teacher from pre-school D indicated insufficient number of computers in the class. Her comments were:

> Children cannot read. So teachers need to be with them. Children need help all the time...one or two computer for all children is not enough." (Interview with Mariam, 18/5/2006)

She also feels that some students' low-level computer skills present a barrier to integrating computers more widely:

> "Another thing is the keyboarding skills. Some children don't actually have keyboarding skills that are as proficient as others. So some of them can type very quickly and do a great job, whereas others really labour over it, you know, sort of the one finger-typing thing. I think that's probably another sort of limitation." (Interview with Mariam, 18/5/2006)

Although most of the teachers believed that the computer should be part of a pre-school classroom, they also pointed out that they require more support and knowledge when problems arise with the computer. Two of the pre-school teachers in the study meant that this was a negative aspect of having a computer in pre-school. Pre-school teachers would need more education about using a computer and how to handle problems that arise. As one of them said: "Lack of teacher training is the major problem." School has to fit in some training as a number of teachers cannot learn quickly and not all of them have computers at home. (Field note, 18/5/2006)

During the teachers' interviews, both teachers from pre-school C and D stated their concern about limited knowledge. The differences between them surfaced as how to find a solution for this concern. For pre-school C, taking a couple of technology classes from the university was a good idea for fulfilling her needs (Field note, 12/5/2006). For Pre-school D, having a computer assistant at the child care centre might be a solution for better integration. On the other hand, Mariam had creative and experimental ideas about learning new computer programmes. She was confident to try out new things on computers and stated that she learned by asking, observing and sometimes experimenting with the computers. (Interview with Mariam, 19/5/2006).

These findings suggest that early childhood educators' levels of computing knowledge contribute to the success with which computers can be integrated within an early childhood classroom. Judge et al. (2004) have argued that unless early childhood educators have an appropriate understanding of how the technology works, they will be unable to effectively integrate the computer into the learning environment provided for young children (p.387). Interestingly, Judge et al. (2004) note that access to professional development for teachers actually represents an access and equity issue for young children, arguing that physical access to a computer in an early childhood setting will not guarantee appropriate learning for young children unless their teachers "have the knowledge and skills to integrate technology into meaningful activities of interest and relevance to children" (p. 387).

However, Masni from pre-school B also pointed out that she had mixed feelings about the computer as she felt a certain resistance towards the use of the computer in pre-schools. She reflected about whether or not the computer had a purpose for children in pre-school, if they really needed computers in pre-school when so many children needed physical contact. In the interview she described how the team had critically reviewed the computer programmes. The team had discussed how they would use the computer and, which one would get to use the computer. (Interview with Masni, 5/5/2006).

7.1.3. Theme 3: Status of computers and Play in Pre-School Classrooms

In classroom B, C and D computers only remained as part of the free play activities. The children in these classroom used computers only for play purposes. The computer activities remained within the playtime rather than having been integrated across other activities and classroom themes. As Kamariah from pre-school C explained,

> "Computers are used only during the free play time. No other times......The computer usage has been lacking" (Interview with Kamariah, 11/5/2006)

In spite of limited computer integration, the Malaysian pre-school curricular philosophy shaped how the teachers facilitated computers activities. Malaysian pre-school's curricular philosophy was that children learn best through play and exploration of their environment, and the teacher's role was to set up the computer and the let the children explore it. Mariam from pre-school D explained that, "If a child is interested in computers, we let them do that. We do not force them to do anything, they do what they want to do" (Interview with Mariam, 19/5/2006).

Kamariah from pre-school C explained that;

"They enjoyed themselves. They are too excited to explore and play new software". (Interviewed with Kamariah, 12/5/2006)

Kamariah also noted that social interaction takes place around the computer. In this classroom, they use to have at least two children on chairs in front of the computer. The teachers commented:

"They make rules as they go along ... discuss whose turn it is ... or one child will often just chat on the sidelines. Generally it's an area with lots of language with children talking to each other and describing what's happening." (Interview with Kamariah, 12/5/2006)

As noted in Kamariah's explanation, the computer was not integrated into the children's activities for several reasons, including inadequate resources such as computers or printers and inadequate teacher training and experience.

Another teacher in Pre-school D also perceived the computer as a learning tool that would aid in the development of a wide range of social skills. This teacher considered that a computer would complement their existing programme. For example:

"I think a computer would help to promote pro-social behaviour such as sharing, taking turns, learning to wait, and cooperating. And helping develop self-esteem in children where they could see something for what they have done that is easily recognisable by other people." (Interview with Mariam, 18/5/2006)

The social nature of the machine (computer) was seen by the teachers as the major justification for wanting to use a computer with pre-school children.

However, in this study, all the teachers view computers as a non-integrated part of the classroom. During the interview they state that they did not integrate the computers into their classroom's curriculum. Most of the teachers stated that lack of teacher training, lack of computer knowledge, lack of children's interest, and children's and teachers' frustration with the technical problems were the major reasons for not integrating computers and using the computers in their daily activities.

All the teachers in pre-school B, C and D believed that computers should be a part of the classroom as long as the children were interested in playing with them. Although they had different reasons for having computers in the classroom, they stated the general belief that children's interest was the main reason to keep the computer in the classroom.

7.1.4. Theme 4: Children interests, feeling and views about computers

In Pre-school B, during entire classroom observations (4 days) only 7 of the 35 children attending in pre-school B classroom, spent time in the computer centre. Table 7.1-3 shows the observations days and estimated minutes children spent in the computer centre.

Table 7.1.3: Children's Estimated Time Spent in the Computer Area in pre-school B

Dates	Children names						
	Muaz (B)	Farhan (B)	Jamil (B)	Syida (G)	Azera (G)	Shakir (B)	Izwan (B)
2/5/2006	15		25	20			
3/5/2006							
4/5/2006	50		10		15		10
5/5/2006	10	25		10		10	
Total	75	25	35	30	15	10	10

The result from the table 7.1-3 indicated that in pre-school B classrooms, children's interest toward the computers was very low. Of the four observations dates, on one day no single child played with the computer. From the total of eleven incidents, during which the children sat in front of the computer, on only four occasions did they spend twenty or more minutes playing. Other children spent approximately fifteen or fewer minutes when they were only able to choose the software and start running the game and always left it unfinished. Most of the time the children play the computers with peers or in small group (2 or 3). As indicated in table 7.1-3, one of the children who used the computer most often was Muaz (boy). According to the teacher,

> "He was quite a shy and quiet boy. He is very quiet during activities in the traditional classroom. In contrast, in the computer centre he is very loquacious; he is interacting with the computer activities, and sometimes he is also speaking with his partner about the listening activity offered by the computer." (Interview with Masni, 4/5/2006.

I noticed that he rarely talked with peers and adults in the classroom but he was confident and comfortable when playing with the computer. While I was watching him in the computer, he naturally clicked the right places on the screen and was mostly able to carry out the game alone. He usually played alone but one time he played with Azera together. (Field note, 4/5/2006). Additionally, the children's interactions with each other or the teacher were very limited in the computer centre because of the lack of interest in computers. The majority of the time, children played alone and did not interact with each other. (Field notes, 2/5, 3/5, 4/5,5/5/2006). Moreover two of the children in this classroom stated that they hate the computer. "Sometimes they might freeze or have turn off suddenly" (Interview with, Akmal 4/5/2006). "They didn't work, they didn't listen to me" (Interview with Jannatul, 4/5/2006).

Table 7.1-4 explicitly shows the observations dates and the children's play times in pre-school C. In classroom C, of the 30 children who attended the classroom, twelve of them directly played or watched another child play with the computer during the observation time. From the total of twenty eight incidents, during which the children sat in front of the computer, they spent twenty or more minutes playing the computer twenty three times.

In pre-school D, the children also spent a considerable amount of time playing or watching others play in the computer area. In classroom D, of the 32 children who attended the classroom, thirteen of them directly played or watched another child play with the computer during the observation time. From the total of twenty-eight incidents, during which the children sat in front of the computer, they spent twenty or more minutes playing the computer nineteen times. Table 7.1-5 explicitly shows the observation dates and the children's play times in the pre-school D computer area.

Table 7.1.4: Children's Estimated Time Spent in the Computer Area in Classroom C

Children's name	Dates				Total minutes
	9/5/2006	10/5/2006	11/5/2006	12/5/2006	
Fahrin (B)	35	20	45	10	110
Jasri (B)	25	15	30		70
Khalid (B)	40		15		55
Lisa (G)		35		35	60
Mohar (B)	25		35	20	80
Naqib (B)	20		50	35	105
Abir (G)		40	25		65
Putri (G)		30			30
Qabil (B)				20	
Zamir (B)	30		40		70
Salima G)		15		30	45
Adin (B)	25		15	20	60

In pre-school C and D, during all observations days, at least one or two children played with the computer. The result from the table 7.1-4 and 7.1-5 indicated that in pre-school C and D classrooms, children's interest toward the computers was very high

Again, it is important to notify that, in all cases the duration of time that each child spent at the computer on any of the given day was determined by the children themselves. Therefore, the duration of the total times for each individual child was different.

Table 7.1-6 showed the dates and the number of children using the computer for each day in classroom B, C, and D. A different number of children used the computer on each observation day. As mentioned in case study 1 (classroom A) this situation was outside the researcher's control because the time and date that each of the children spent at the computer on any given day was determined by the children themselves.

Table 7.1.5: Children's Estimated Time spending in the Computer Area in pre-school D

Children's name	Dates				Total minutes
	16/5/2006	17/5/2006	18/5/2006	19/5/2006	
Tim (B)	20		25	15	60
Wong (B)		40	10		50
Norman (B)	35		30	15	80
Gafar (B)		20		25	45
Erra (G)	25		15		35
Najib (B)		15			
Rafiq (B)		35		30	65
Adam (B)	10		25	15	50
Nani (G)			25		25
Jay (B)	35		20	50	105
Nash (G)	40	35			75
Atif (G)	10		25	15	50
Mim (G)		25			25

Table 7.1.6: Dates and Number of Children Used the Computer in Classroom B, C, and D.

Classroom	Total of Children Using the Computer
Classroom B	
2/5/2006	3
3/5/2006	0
4/5/2006	4
5/5/2006	4
Classroom C	
9/5/06	7
10/5/06	6
11/5/206	7
12/5/206	6
Classroom D	
16/5/06	7
17/5/06	7
18/5/06	7
19/5/06	7

In the interview, the following reasons were given by the children from classroom C and D for the questions why they like the computers and what they do with the computers.

> "I like computer, I did a picture and colour" (Children in pre-school C,12/5/2006)
>
> "Play with my friends on the computer" (Children in pre-school C, 12/5/2006)
>
> "Play games like soccer" (Children in pre-school D,19/5/2006)

When I asked if they thought computers helped them learn, one of the children said:

> "Yes, the programme will tell me what to do.
>
> *How does it do that?*
>
> "You put words in and when you click on it, it tells you the word. Then you get to learn it, if you don't know it. You can also hear the sound. It's really fun!" (Children in pre-school D,19/5/2006)

With regards to the questions about their preference of playing with a partner or alone, most children in pre-schools, B, C and D responded that they preferred to work with a peer than to work alone. Eighty five percent of the children in pre-schools B, C and D indicated that they like working with a partner because "partner can help them" and "having fun". A smaller percentage (15%) of children states that they like working with peers because they like the partner.

The result is consistent with the NAEYC's statement on computer environments in early childhood education which states that children choose to work with peers at a computer centre. When asked the reason why they preferred working with a partner, a large percentage of children perceived the partner as a helper. They said the partner provides the assistance they need. Some of the children said,

> "Nobody will help me and give some ideas, if I play alone". (Children in pre-school B, 5/5/2006)

> "I like the friend helping me with it and "because it's good fun" (Children in pre-school C, 12/5/2006)

> "They help you when you're stuck on it" (Children in pre-school C, 12/5/2006)

> "I can get more ides when working with friends" (Children in pre-school D, 17/5/2006)

> "It's fun play the games with my friend" (Children in pre-school D, 18/5/2006)

> "We can play and laugh together. I'm really happy when play the games with my friends (Children in pre-school D, 18/5/2006)

Similar views were also expressed by Jay and Erra from Pre-school D.

> Erra: Jay teaches me how to delete and to use arrows....how to get the basic shapes...

> Jay: I learnt to share

As Clement (1999) stated that "children prefer to work with a friend rather than alone and they foster new friendship in the presence of the computer".

In stage two, the researcher identified the children who never play at the computer centre during the whole observation period. I noticed that during the whole observation period, 12 from 32 children in pre-school C and 10 from 30 children form preschool D never play at all with the computer but in pre-school B, 20 from 32 never play at all with the computer. (Appendix V presents the name of the children who never play with the computer in pre-school, B, C and D). Most of the children gave comments like:

> "I don't now how to use the computer". ." (Elijah, 5/5/2006),
>
> "I don't like the computers! It is not fun at all." (Kamil, 5/5/2006),
>
> "Don't feel like it. I'm not good at that stuff. I hate it." (Sasha, 13/5/2006)

One child in classroom C replied that she liked "nothing" and disliked "everything" about computers. When probed, "What else do you like about computers?" (Musliha, 13/5/2006),

The rest of the children who expressed dislikes tended to specify social interactive or motivational details like "I don't like being pushed off" (Interview with Rosman,16/5/2006),

> "I don't like the hard games" (Interview with Zainal,16/5/2006) and
>
> "No way. It will be boring and I don't like it" (Interview Rashid, 17/5/2006)

7.1.5. Theme 5: Children's interactions with peers

This section provides the findings of computer use and children social interactions that exist in case study II, III and IV. Therefore the discussion is also based on emerging themes derived from case study I.

These interactions are described in detailed in the following sections. Individual children's interactions are also discussed as related to the pattern that emerged in case study I.

Table 7.1-7 illustrates the frequency of the seven subcategories of cooperative behaviour occurring each day of the observation period. Over the course of the study, there were 91 occurrences of children's social interaction with peers during computer use. On certain days more interactions between children were observed than on other days.

Within the child-teacher behaviour in pre-school B, C and D, "Works cooperatively (Directing and tutoring)" was found to be the first most frequently observed form of teacher-child interactions behaviour in pre-school B, C and D (22 times), followed by "Speaks or signs to peer at the computer (187 times "and "Shares idea with a peer (17 times)" respectively. Less child-teacher interaction behaviour were observed in pre-school B compared to pre-school C and D.

Table 7.1-8 illustrates the frequency of the four subcategories of unfriendly behaviour towards peers occurring each day of observation period. Over the course of the study, there were only six occurrences of children's unfriendly behaviour towards peers during computer use, all in pre-school D.

Table 7.1.7: Child Collaborated With Peer at the Computer in Pre-school B, C and D

Date	Speaks or signs to peer at the computer	Asks questions or signs question to peer about an activity	Takes turns at the computer	Shares idea with a peer	Explains to another child how a device or programme works	Works cooperative ly (Directing and tutoring)	Moves to improv e his or her view of the monito r withou t interfer ing with others	Total
Pre-school B								
2/5/06	1	1	0	0	0	1	0	3
3/5/06	0	0	0	0	0	0	0	0
4/5/06	2	1	1	1	1	2	0	8
5/5/06	1	1	0	0	0	1	0	3
Total	4	3	1	1	1	4	0	14
Pre-school C								
9/5/06	1	1	0	2	1	3	0	8
10/5/06	2	1	1	2	1	3	0	11
11/5/06	2	1	1	3	1	2	0	10
12/5/06	2	1	1	1	2	2	0	9
Total	7	4	3	9	5	10	0	38
Pre-school D								
16/5/06	2	1	2	2	1	2	0	10
17/5/06	1	2	1	2	1	3	0	10
18/5/06	2	1	2	2	0	1	0	8
19/5/06	2	2	3	1	1	2	0	11
	7	6	8	7	3	8	0	39
Total for pre-school B,C and D	18	13	12	17	9	22	0	91

For each subcategory, an excerpt of children's conversation is provided to understand better the nature of each type of social interaction. The following section provides analysis data for children's social interaction in Classroom B, C and D.

Table 7.1.8: Child demonstrates unfriendly behaviour toward peers in the computer area.

	Monopolises computer	Child frowns, hits, or pushes to gain or maintain	Pushes peer away	Manipulates, controls, directs others	Total
2/5/06	-	-	-	-	0
3/5/06	-	-	-	-	0
4/5/06	-	-	-	-	0
5/5/06	-	-	-	-	0
9/5/06	-	-	-	-	0
10/5/06	-	-	-	-	0
11/5/06	-	-	-	-	0
12/5/06	-	-	-	-	0
		-	-	-	0
16/5/06	-	-	-	-	0
17/5/06	1	1	-	2	4
18/5/06	-	-	-	-	0
19/5/06	1	-	-	1	2

The following section provided analysis data for children's social interaction in Classroom B, C and D

7.1.5.1. Findings 1: Classroom B

Jamil, Syida and Farhan (4/5/2006)

Jamil seated directly in front of the computer screen with his hand firmly and comfortably on the mouse. Another child, Syida's chair is slightly to the side of the computer, where he can see the screen easily. Jamil is purposefully moving the mouse while watching the screen. Their interactions with the programme seem successful and enjoyable.

Jamil and Syida are communicating and, although their conversation is inaudible, Jamil is pointing to the screen. It seems he is giving suggestions to Syida. Before long Farhan reaches over and takes control of the mouse from Jamil, who does not object. Farhan unsuccessfully tries to navigate through the programme and then relinquishes control back to Jamil. Jamil manoeuvres through the programme successfully, and then the two boys clap and rejoice together over their accomplishments.

7.1.5.2. Findings 2: Classroom C

Khalid, Putri and Naqib (11/5/2006)

Khalid is seated directly in front of the computer using a recently introduced programme. Naqib seated to the side watching the action and begins playing with another programme on his computer. Putri pulls up a chair and sits on the other side of Naqib and Khalid. Naqib talk about the programme. Putri's attention alternates between Khalid's and Naqib's computer activities.

In this example, Putri exhibits a classic example of Spectator/ Onlooker behaviour, the children who were the least involved with the computer (Freeman & Somerindyke, 2000). During this observations period she interacted at the computer centre on only two occasions. She shows increased interest, but is not yet ready to spend significant amounts of time observing. She neither attempts to control the equipment, nor to explicitly request help. It seems possible, and even likely, however, that she will continue to be a Spectator, and will, before long, become a Super On-Looker as she moves closer to playing a controlling role. Computer Navigation is at this time beyond her ZPD, but competencies will likely emerge as a result of her efforts to actively seek scaffolding from her peers.

Putri reminds teachers of their responsibility to provide the equipment, environment, and encouragement, which will serve as scaffolding as children progress from an awareness of, and interest in, computers into effective independent Consolidated Navigation of developmentally appropriate software. In relation to this, teachers can set the scene by choosing software that encourages cooperation and higher-level thinking and by encouraging and supporting peer mentoring and scaffolding like that described in this study.

7.1.5.3. Findings 3: Classroom C

Mohar , Jasri and Salima (10/5/2006)

Mohar and Jasri were playing the game when Jasri came to the computer. Due to the lack of the chair available, they started to push each other. Several minutes later, Salima left and Jasri sat down on her chair.

Mohar carefully listened to the clues and clicked the right spots on the screen while Jasri was watching him. He said, "Look, that's the story book and the song. I want to listen to the song". Then he clicked on the right clues. When the game started playing a song, both Mohar and Jasri sang with it. Jasri and Mohar got excited and demanded, "Let's do the fairy song again." As he played it again, both sang with the fairy, several minutes later they left the computer table and went to the dramatic play area.

It appears that Mohar and Jasri like working together. They seem to work very well together. These two children seem to work very positively at the computer.

7.1.5.4. Findings 4: Classroom D

Adam and Nash (18/5/2006)

Nash searches for the painting programme. Adam uses the computer next to Nash and also opens the painting programme. Nash draws the animal and mixes the colours. Adam starts to create his own animal and he giggles at his animal. Several minutes later, Nash stops drawing and mixing colours and decides to print. He clicks the print button and begins to print. Adam looks with curiosity and decides he wants to print too. He asks Nash, "How do you do that (print)"? Nash shows him the button and he clicks the print button but there is an error. He becomes frustrated and asks the teacher for help. The teacher says, "Look, there's no more paper left. I will do it for you". The teacher puts the paper in the tray and says, "Ok, you can print it now".

Adam begins printing his picture and watches intently as it comes out. He grabs it and shows it to the teacher.

7.1.5.5. Findings 5: Classroom D

Norman and Nash (18/5/2006)

Even though the present study did not focus on children's discourse and language use, the researcher found that the types of expression children used in their social interaction, was dramatically affected by the types of software in which they were engaged. The finding was supported by the early work of Borg and Dickson (1996) and Emerson (1993) which reported that software characteristics had a great influence on children's verbal communication.

In example one, children used more complex and richer language to express their ideas while using open-ended software: meanwhile, more imaginative and dramatic expression was evoked.

Example 1: My Make Believe Castle (open-ended software)

Norman: I'm going to lock the Prince and Princess in the prison.

Nash: No put them on the boat and go sailing

Norman : How about the Juggler? Lock the Juggler in the prison.

Nash: Ok.

Norman : Yeah.... (Excited)(He is trying to move the juggler in the prison)

Nash: Oh..No! You mess it up.

Norman : Let me get this person out first.

Nash : Nobody's there. He became the bat

Nash :Hey, lock the juggler up

Norman : Ok, I need the key.

Nash : He is out.

Norman : I am going to cut the juggler, I don't need him.

Nash : The scissors is here (Point to the screen).

Norman : (Use the scissors to cut the Juggler).

Nash : Ha..ha...haa (laugh)

Nash : Lock the door. (Points to the screen)

Norman : How can I use the scissors to lock the door?

Nash : You need to click the arrow (Points to arrow icon on the screen).

Nash : Then put the princess here (point to the screen)

Norman: (followed Nash's direction)

Nash : Then, go and click the prince....the prince..

Norman : Ok, I know how to do that...!

Nash: Lock the prince!

Norman : Ok, I know it...Don't keep pushing me!

Nash : Ok, good, click the green light.

Nash : Hey what are you doing? Oh, No! The princess is falling into the water now!

Norman: Oh sorry, I'm going to save the princess now; otherwise, she will get wet.

Then they continue playing the game

The open-ended software programme enabled children to create imaginative stories and then get them into a form of dramatic play. In addition, children saw the characters in the programme as if the were alive. For example, in the My Make Believe Castle programme, she made the princess fall into the water and then she felt worried and said: "I'm going to pull the Princess out of the water: otherwise, she will get a cold". Children often talked to the object or characters, which corresponds with the study by Borg and Dickson (1986) which stated that children would sing or humm along with microcomputers. The findings were consistent with the study by Genish, McCollum, and Strand (1985) which reported that kindergarten children considered computers as a live playmates instead of a cold machine by using "you", or "he" rather than "it" to call the computer.

7.1.5.6. Findings 6: Classroom D

Wong and Gafar (19/5/2006)

On the other hand, I found that the children tended to use simple sentences and or single words to express their feelings when they use the computers especially when they use the drill and practice software. The following example illustrated how Wong helps Gafar to do what he wants to do with the programme.

Wong: This one (pointes to the screen)

Gafar: You need to hold the button. Yes, like that.

Wong: Hey, click here!

Gafar: I did.

Wong : Hey, this one. (Claps her hand and laughs)

Gafar: Let's play the other game.

Wong : Click this button, the next one, next....next...ok, then you can choose. (Points to the screen)

Gafar:: This one, ok?

Wong : No, we did this already.

Wong : Ok, this one. Oh...it is scary.

Gafar: It's scary!

(Both laughing...and then they played the puzzle game).

Wong: No, this one goes here; this is big-foot giant.

This goes to mermaid.

Wong : No you did it wrong.

Gafar: Hey, look (laughing).

Wong : Let's go back to the haunted house.

Gafar: No, Let's go to the next game.

Wong: This one, this one. (Points to the screen)

(Both laughing)

Wong : Hey, you click a wrong one (both laughing)

Wong : Hey, let's play the next game, hey...next....next.

7.1.5.7. Findings 7: Classroom C

Social interactions also occurred when one child comments on or criticises the game without expecting to receive the other's feedback. The following is an example of commenting from Lisa when she watched Abir draw the picture on the computer.

Lisa and Abir (18/5/2006)

Lisa: Wow, that's amazing.

Abir: (Looks at the screen and moves the mouse)

Lisa: This is an easy one.

Lisa: Wow..., four eyes, each person has two eyes. I have seen two-headed people before.

Abir: (Keeps moving her mouse without answering)

7.1.6. Theme 6: Children's Social Interactions with teachers

Table 7.1-9 presents the estimated time spent by the teachers in classroom B, C and D in the computer area.

Table 7.1.9: Teachers' Times Spent in Computer Area in Classroom B, C and D

Dates	Minutes
Classroom B	
3/5/2006	10
4/5/2006	0
5/5/2006	10
6/5/2006	15
Total minutes	40
Classroom C	
9/5/2006	30
10/5/2006	35
11/5/2006	25
12/5/2006	20
Total minutes	100
Classroom D	
14/5/2006	30
15/5/2006	25
16/5/2006	15
17/5/2006	35
Total minutes	105

Table 7.1-9 presents the time spent by the teachers in classroom B, C and D in the computer area. The result from the table 7.1-9 clearly display the differences in the time teacher's in pre-school B, C and D spend in the computer area during the observation period on different days. As indicated in the table 7.1-9, teachers in pre-school B spent less time in the computer area compared to teachers in pre-school C and D. Teachers in pre-school C and D provided enough time to interact with the children while the children used the computers, and at the same time they provided quality child-teacher interactions by scaffolding children's use of the computer.

As Kamariah, "I need to instruct more. I have to instruct my children on how to use the mouse and how to use the keyboard." (Interview with Kamariah, 12/5/2006). In contrast, from the 4 days observation period, the teachers in classroom B spent 40 minutes in the computer area. As Masni notes that, "I was mainly responding to what I thought were technical problems, like children losing text or coming out of the programme. I am sure that some of the children could sort this out themselves." (Interview with Masni 4/5/2006). Her actions may partly be explained by the location of the computers in the teachers' room, a factor that could have limited her opportunity to interact with the children using the computers.

In addition she offered the following explanation for her lack of joint activity with children using the computers:

> "I know I do not use the full potential of the computer. Actually I need to interact more with children at the time and providing feedback. The children really seem to enjoy using the computers, but get more from teacher involvement I think. I need to keep an eye on the children. (Interview with Masni, 4/5/2006)

And for the question, "What has prevented you from doing this more often?"

> "Lack of time and confidence. More courses would be good" (Interview with Masni, 4/5/2006)

One child in classroom B made comments like:

> "They don't help us we do it on our own."
>
> "They don't help you? I asked."
>
> "No, sometimes they just talk with the other people and we just play on the computer on our own." (Interview with Anita, 5/5/2006)

In addition, for example, on many occasions I observed in classroom B when independent computer activities were being done by children during free play period, a child would go over to the computer when another child finished and their name was next on the computer time list. The child called would sit at the computer and interact with the assigned software programme being used that day in class or choose software. The children I observed working independently in this situation did not

interrupt the teacher to ask for computer assistance. I have noted that the children who encountered computer problems would sit and stare at the computer screen. At other times I observed that a child would click around on the computer screen with the mouse to try to get the computer to respond. If a teacher was in close proximity to a child interacting with a computer and encountering a computer problem then support could be provided by the adult. The study results offer implications for adults guiding young children in school settings. When an adult is in close proximity to a child and consistently responds to the need for assistance, children are able to have successful sustained computer interaction. Adults need to be aware of children's activities and interactions as the computer software or hardware are being used. In addition the children need to know that teachers will consistently respond to questions asked or assistance that is needed when using a computer. To prepare young children for future educational endeavours, as well as integration into a technological society, guidance and acquisition of computer knowledge needs to be part of a child's learning experience (Roblyer, 2003).
Labbo *et al.* (2000), in their case study of a kindergarten computer centre, suggest that an effective use of the technology is when the teacher supports children's literacy needs by targeting time in the computer centre. Here, through joint activity children's comments and thinking are linked to the cross-curricular themes (what Labbo *et al.* call 'thematic units') and literature-based activities occurring in the classroom.

Table 7.1-10 illustrated the frequency of the five subcategories of teacher-child interactions behaviour occurring each day of the observation period. Over the course of the study, there were 82 occurrences of children's social interaction with teachers during computer use. On certain days more interactions between teacher and children were observed than on other days.

Table 7.1.10: Child-Teacher-Child Interactions

	The Child Can:					
Dates	State at least One rule for using the computer when asked	Explain the problem to an adult for help	Follow rules or directions given by an adult	Communicat e a process to an adult	Express enthusiasm verbally to an adult	Total
Pre-school B						
2/5/06	0	0	1	0	0	1
3/5/06	0	0	0	0	0	0
4/5/06	1	2	2	0	0	5
5/5/06	0	1	0	0	0	1
Total	1	3	3	0	0	7
Pre-school C						
9/5/06	1	3	3	2	2	11
10/5/06	2	2	4	1	0	9
11/5/06	1	2	5	1	1	10
12/5/06	2	1	3	0	1	7
Total	6	8	15	4	4	39
Pre-school D						
16/5/06	1	3	2	1	0	7
17/5/06	1	3	4	1	0	9
18/5/06	1	4	4	2	1	12
19/5/06	1	3	4	1	1	10
	4	13	14	5	2	38
Total for pre-school B,C and D	**11**	**24**	**32**	**9**	**6**	**82**

Within the child-teacher social interactions behaviour in pre-school B, C and D, "follows rules or directions given by an adult" and "Explains the problem to an adult for help" were found to be the first and second most frequently observed form of teacher-child interactions behaviour. However, less child-teacher interaction behaviour was observed in pre-school B compared to pre-school C and D.

Table 7.1.11: Child demonstrates unfriendly behaviour toward adults in the computer area.

	Expresses hostility	Expresses hostility verbally to adult	Ignores adult when adult attempts interaction	Total
2/5/06	0	0	0	0
3/5/06	0	0	0	0
4/5/06	0	0	0	0
5/5/06	0	0	0	0
9/5/06	0	0	0	0
10/5/06	0	0	0	0
11/5/06	0	0	0	0
12/5/06	0	0	0	0
16/5/06	0	0	0	0
17/5/06	1	0	1	2
18/5/06	0	0	0	0
19/5/06	0	0	0	0
Total for pre-school B,C and D	1	0	1	2

Table 7.1-11 presents the frequency of three subcategories of child demonstrates unfriendly behaviour toward adults in the computer area. Data analysed showed that this types of behaviour were observed only on 17/05/2006.

The following findings detail the children's social interaction with teachers at the computer centre.

7.1.6.1. Findings 1: Classroom B (Field note, 4/5/2006)

The following example illustrated how the teacher as a troubleshooter solves technical problems:

Around 10.50 am (4/5/2006), Suria came to the computer centre. First he looked at the CD case and grabbed a baseball game CD. Then he loaded the game by himself and started to play with it. A couple of minutes later, child Shafiq came and sat on the chair next to Suria. Together they started to play the game. Both boys were laughing at the game. Suddenly the screen froze and Suria could not move the mouse. They looked at each other and talked, but I could not hear them because of the distance between us. Later, Shafiq walked up to the teacher (Masni) and told her about the problem. The teacher came over and restarted the computer. Almost half and hour later, all of the computers lost their power. While one of the teachers and I tried to find the problem, we realised that somebody had unplugged the main outlet that went to all computers (Field notes, 4/5/2006).

7.1.6.2.Finding 2: Classroom B (Field note, 4/5/2006)

Azera: "teacher, the mouse does not work. I clicked on the icon but it does not move".

Teacher: "let me see. Oh I see it is the mouse ball it is dirty let me clean it and it will be ready to work."

7.1.6.3.Finding 3: Classroom C (Field note, 12/5/2006)

The following transcript indicates child-teacher computer interaction about the understanding of one of the English game activities:

Teacher: What word are you looking for?

Zamir: Huge. I want to find the similar meaning!

Teacher: Look for it in the context

Zamir: Yes but that word is not in the conversation

Teacher: Do you think that huge is big or small? Huge is something that is enormous. For example an elephant is huge while a mouse is not huge.

Zamir: Ok now I know; it is something gigantic, like a mammoth." (Then she clicks the word big on the computer screen).

The previous teacher interactions show that there are times when children need to interact with the teacher to help them solve technical barriers and explain those computer activities that they do not understand. In both situations the teacher helps students construct their understanding when they work with the computer. It is important to the interlocutors to gain knowledge from their interactions and probably there is a link between knowledge gain and the frequency of their interactions. Doing pair work the students interact more with each other and perhaps they gain more knowledge and if they don't interact enough then their chance to learn might be poor. The previous aspects are examined in the next section.

7.1.6.4. Finding 4: Classroom C (Field note, 10/5/2006)

In the next case, the teacher was involved with children at the computer centre when the two children (Ikin and Qabil) used the computers to create habitat scenes. The programme needs the children to click the animal that can be seen in the river.

Teacher: Tell me what you see in a river habitat.

Ikin: I see um water. (Point to the screen)

Teacher: A river habitat has moving water. But what kind of animals are you going to see there?

Ikin: Otter (Then he click the "otter" icon)

Qabil: Frog!

Teacher: And what else? What else might you see in the river?

Teacher:Quack, quack....!

Ikin: Duck.

Teacher: You might see a duck. What else? What would be down right (teacher pointing to computer screen).

Qabil: Tadpoles

Teacher: Yes, you might see tadpoles. What else might you see? Would you see fish?

Ikin:Yes, I know, I know how to play now.......!

When I asked the two children, ", do you like to work with your friends?

> Ikin: "Yes, I like to work with my friends because I can compare my knowledge with the knowledge of my partner; if I am wrong he can correct my mistake and the opposite is true; if I know that he is wrong then I can correct his mistake."

> Qabil: "I like to work with my friends because I talk with my partner. I can help my friend. Sometimes he does not understand then I explain to him but sometimes I also don't understand the computer conversations then he explains the meaning to me or he explains to me the actions that the computer is requesting us to do."

(Field note12/5/2006)

7.1.6.5. Findings 5: Classroom C (Field note, 11/5/2006)

The teachers also sometimes had to intervene when a child's play became too rough or disruptive. In one such conflict, Norman had a printout of something he had made and was trying to prevent the other children from using the computer.

Another child, Rafiq quits the village scene and opens the city scene. Norman holds his printout in front of Rafiq's screen. "Stop!" Rafiq says. "Norman, listen to what Rafiq is saying," the teacher tells Norman. Norman moves and lets Rafiq use the printer.

The teacher in this case stressed the importance of the children listening to each other while working on the computer. This encouraged the children to communicate their problems, rather than be confrontational.

7.1.6.6. Finding 6: Classroom D (17/5/2006)

Jay, Tim and Teacher (Mariam)

Three of the children were very involved in the Darby the Dragon game by helping each other, talking, singing and laughing. A couple of minutes later, Tim was shouted to by Jay, "Get that one." Jay said, "It is Sparkel. Stop Tim. There are a lot of hotdog lipstick." Tim was very anxious and stood up on his chair while pointing at the screen. He shouted, "Get that" and made noises "Bloh, Bloh". The teacher (Mariam) noticed the situation and came to the computer table. She asked Tim, "What's happening here? What's happening Tim? Tim said, "I'm a monster." Jay interrupted, "He spit." Mariam asked Tim, "You are a Monster and you spit at her? Tim did not answer. Jay entered the conversation, "I, I, he said I spit at him, but I did not. It was an accident." Mariam calmly asked Tim, "Are you watching Jay or do you want to do something else this morning?" Tim said I want to do this. In order to solve this conflict, Mariam suggested that, "You want a turn after Jay .Would you like me to put your name on the board and then when Jay is done we will call you? He accepted but he refused to do another activity while waiting for his turn. Mariam sat down on a chair at the computer table in order to make sure the children were playing peacefully.

Suddenly, Jay left and Tim grabbed the mouse and sat on her chair. According to Mariam, "Darby the Dragon" was his favourite game, so he is rather experienced in finding clues. Mariam carefully watched and told him, "They are telling you to click on a mask, but when you hit that mask; it doesn't work, does it? You have to choose a different one." While Mariam gives directions to Tim, Erra told Sakinah (another teacher) what had happened earlier. Erra and Tim started yelling at each other about the spitting accident. Two of the teachers try to calm the children down by talking about their feelings. Several minutes later, everything returned to normal.

7.1.6.7. Findings 7: Classroom D (Field note, 19/5/2006)

The following example illustrates the situation when the teacher herself was participating in the children computer play in classroom D. In the following example the teacher involved herself in children's computer play by asking questions, giving directions and praising the children.

Erra and Imah (19/5/2006)

Erra and Imah came to the computer area. They choose a "Turtle game" and set it up on the computer. After the game started, both of them click everywhere on the screen. One of the teachers (Sakinah) comes and says: Let us see, what we need to do here?" "How can we draw the line using this turtle?" Oh, we need to move the turtle up, then to the left, down, and to the right". So hit the left button now! After Erra clicked the button the teacher says, "Wow, isn't this beautiful?" "Look what happens when you move the turtle". "This is a very special programme. After listening to the direction from the game, Erra clicks the right button. Again the teacher says, "Very good, you did it well, you were careful and planned it well".

In this example the teacher was engaged in the problem solving with Erra. In this example the teacher seems to be more like a peer, not like an omniscient teacher who only dispenses knowledge. If the information had not come from the teacher, it may have taken more time for trial and error to solve the problem. As Dugger and Young noted, however, trial and error is sometimes quite typical in the technological process (Dugger & Young, 1995 p.10).

7.2. The Principals views of the challenges and opportunities in integrating computers into pre-school classrooms

In looking at the original questions posed by the study, the role of the principals was not listed as the major source of data collection for this research study. As a consequence there was not an emphasis on the role of the principals in the case study design. In hindsight this is probably one of the major limitations of the research. By not making it as obvious as the other support issues, only the views of two principals, namely Principal A and Principal B were sought through the semi-structured interview. Implementation, however, necessarily involves stakeholders and issues of leadership. Yee (1999) proposed five types of information technology leadership from a study of school principals in New Zealand, namely, technology entrepreneur, technology caretaker, technology trainer, technology modeller, and technology learner

In general, both of the principals were very supportive regarding the use of computer technology and had a vision for the use of ICT in the teaching and learning programme. In addition, they regarded the integration of computers into the pre-school classroom as an urgent priority and felt enthusiastic about the prospect.

Neither reservation nor negative feelings were reported at this point. (Interview with principal A and B, 22/5/2006).

Regarding the challenges to be faced and the teachers' roles in the integration of computer technology in pre-school classrooms, principal A explained,

> "I think that the major challenges to be faced in the integration of computer technology in pre-school classroom will be the pedagogical implication, the impact on the structure and content of the curriculum, classroom organisation and practice and the change of the teacher role" (Interview with principal A, 22/5/2006).

According to principal B,

> "For this (integration of the computer) to be successful, teachers must accept a change in their role, they are no longer the central figure in the teaching and learning process, but instead co-learners with the student. ......as student/teacher interaction becomes more student-centre". (Interview with principal B, 22/5/2006).

The principal B explained that,"

> "Pre-school classrooms need to be organised differently, teachers' views of teaching and learning need to be reassessed and teachers need to accept that some pupils will know more about the computer technology than they do". (Interviewed with principal B, 22/5/2006).

The following excerpt from an interview describes a principal's views when talking about the difficulties they encountered in the implementation:

> "Although it is necessary to implement ICT in early childhood education, there are certainly some difficulties. Many early childhood settings have experienced substantial difficulties in raising funds to enable construction of ICT infrastructure and the integration. Teacher training is also a halting factor, as most of the pre-school teachers started their teaching career in 1980s, when information and communication technologies had not yet been advocated. Most of our pre-schools teachers are IT illiterate, indeed, they haven't taken any ICT courses, and there are accordingly difficulties in integrating in our curriculum". (Interview with Principal A, 22/5/2006)

This excerpt reflects the typical views shared by most of the pre-school teachers in this research study. It summarises the major difficulties that pre-schools encountered in the implementation: fund-raising problems, few resources, teacher training problems, and IT illiterate teachers. Synthesising the qualitative data, the results could be presented as follows. There were three types of challenges facing the integration of computers into Malaysian pre-school classrooms (a) a lack of IT literate teachers, hardware and software, funding support, technical support, room and time; (b) technical difficulties in using computer in pre-schools; and (c) side effects that seriously concerned the participants.

This excerpt provides a detailed illustration of their concerns:

> "When a child enjoys learning with ICT, it is likely that he or she will be eventually addicted to the computer games. I'm afraid that this will reduce opportunities for social interactions between peers and friends, and will further hamper social development in these young children. In addition, implementing new technologies in classrooms will inevitably cause challenges to the pre-school teachers, as they are used to the existing teaching style and tend to be resistant to the new technologies". (Interviewed with Principal A, 22/5/2006)

According to principal B,

> "Training is useful, but it takes time and money, indeed. Anyway, training can only enable teachers to understand how to operate ICT; the integration itself could not be learnt by training" (Interview with Principal B, 22/5/2006)

This quotation reflects the interviewees' major concerns about the integration of computers into pre-school classrooms: children's addiction to computer games, reduction of social interactions, disadvantages in social development, pedagogically inappropriate software, technical difficulties, Information Technology illiterate teachers, on-the-job training, and the integration problem. It implies that the principals have also realised the disadvantages of integrating computers into the pre-school classrooms and have some shared concerns about the implementation.

Finally, the following is an excerpt from the interview that has encompassed most of the solutions raised by the interviewees:

> "We have tried and actually got some solutions to these problems. First of all, maximise opportunity through appropriately using the existing resources, such as more group time on ICT activities. We also try to arrange on-the-job training to make all the teaching staff IT literate. Besides, we could ask for help from the nearest primary schools for the technical support" (Interview with Principal A, 22/5/2006)

The researcher summarised the solutions suggested by the Malaysian principals as follows: (a) "outsourcing" approaches, including training and involving parents, asking help from IT companies, and collaborating with schools and other parties in the local community; and (b) within school approaches, including offering in-service training to staff, applying for funding support, and setting up an IT team to offer technical support.

7.3. Conclusion

Some children cannot seem to resist migrating to computers. The opportunities for friendships, conflict resolution, taking turns, paying attention, following instructions, and collaborating with others exist in cooperative computer activities that enable children to develop social skills. Computers can be a context for greater peer interaction, enabling young children to express their feelings and to demonstrate peer related social skills. Viewing cooperative computer activities as a context for peer interaction, in both current and future environments, provides support for addressing social competence, play, and child directed utilisation of technology in early childhood settings. It is also important for the adult to provide appropriate levels of assistance rather than arbitrary intervention. If the child is required to observe passively the superior skills of control and dexterity of the adult, they will inevitably get bored, feel powerless, become frustrated, and not have the opportunity to develop their own skills. Without sufficient assistance however, the child may feel frustrated in not being able to achieve what they want or they may feel inadequate and not want to use the computer in the future.

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Chapter 8: Discussions and Conclusions

8.1 Introduction

In this final chapter, the researcher reflects on her findings to the general and specific questions that framed the research study. Recommendations for integrating the computers in pre-school classroom are made, along with suggestions about how such changes would be implemented. The researcher then makes some concluding comments that emerge from her personal reflection on the research process. Finally, some possible directions for future research are suggested.

8.2 Discussion of the questions

Chapter 1 (see section 1.4) introduces the focus question which framed the study. The major question of interest in the present study is to investigate the social interaction behaviour of children when using computers in the Malaysian pre-school classroom. The five questions that address these conditions are revisited.

As mentioned in chapter 1, the aims and objectives of the research are to gain a better picture and understanding of children's social interaction during computer use. The responses to these questions are based on the findings of the analyses of the qualitative data sources presented in Chapters 6 and 7.

8.2.1 What kind of social interaction is demonstrated by children when engaged in computer play activity?

Children are involved in complex social interactions behaviour as they work with peers on the computer screen.

In early childhood, friendships are first established through mutual interests, as children interact with others (Hartup, 1992). In addition, when children collaborate with friends, information is transmitted from one person to another, which fosters mastery of specific tasks. Such interactions provide opportunities for conflict resolution, which enables children to develop social skills. Free play activities provide opportunities for greater peer interaction, enabling young children to express their feelings (Pavri, 2001).

The findings showed that the children were involved in complex social interactions as they composed on the computer screen with peers. Children sought to gain attention and approval from peers, mark their uniqueness, and manipulate and/or maintain their relationships with others. Their talk and interactions with the computer reflected distinct social agendas. These agendas ranged from maintaining equality and fairness among peers, to assertion of power and personal control over others. Individual social goals were equally diverse, including placing oneself in the roles of director, information provider, evaluator, teacher, student, peer, and protester. All of these social purposes acted as guiding forces in children's composing talk and actions.

In this study, children interact with peers more effectively when they had agreed upon a system for turn-taking and sharing control of the tool. When children had a mutual understanding of the content of their composition including a general conceptual framework for determining appropriate story content, their interactions were often more task focused than when centring on one another's abilities and competences (Wani and Athirah, 13/10/2005, p. 208 and Zaid and Afifi, 21/10/2005 p.209). In addition, when partners had the skills to build upon and incorporate one another's ideas, and did not differ tremendously in relative status, as seen with Tina and Yati (1/11/2005, p.213), the affective tone of the interaction was observed to be more positive. The range of social behaviours that children engaged in was less important for the success of the interaction than the qualitative dimension of those social behaviours.

Furthermore, the findings also showed that the children fluently engaged in helping peers by showing or pointing out directions and using a limited number of simple words to explore software programmes, for example, "Look at this" when pointing at an error sign to change pages; "Click this, click this" when touching the arrow symbol on the screen. (Azhar and Zaki,12/10/2005, p.206).

What was striking about the findings was that the unequivocal negation of the concerns expressed by the Alliance for Childhood Report (Cordes & Miller, 2000) of the negative effects of computer use on children's development. According to classroom teachers, the computer energised children's play. Children were active participants in the computer learning environment. From the observations, the researcher noticed that they could control the content, the difficulty level, and the pace of the skill they were attempting to master. The success they experienced with the computer encouraged them to use it frequently. In addition the children became more patient and displayed more control of impulsive behaviour. The children learned to share and take turns. Opportunities for peer to peer mentoring encouraged a sense of competence and cooperation. Peer relationships improved. In terms of their emotional development, children's self confidence and self esteem increased noticeably (Zaidi and Azhar, 24/10/2005,p.215; Norman and Nash, 18/5/2006, p.253; Wong and Gafar,19/5/2006, p.255).

Overall, the results tend to support views that working with computers can have a positive influence on young children's socialisation. With the creative and dynamic use of computers in the classroom, researchers have consistently observed high levels of spoken communication and cooperation as young children interact on the computer (Clements, Nastasi, & Swaminathan, 1993). The tendency to talk to peers more about the task was consistent across the settings (Four pre-school A, B, C and D). Asking adults for help was also observed frequently for all the children, although this trend was especially strong among the children who have less computing skill. Looking at/manipulating equipment occurred less frequently for the children in all cases. In addition negative behaviour such as aggression occurred relatively rarely in this study. The findings of the study also tend to support Linderoth et al. (2002), which indicated that young children prefer to play computer games with their friends than on their own, or that children show more interest in using computers when there is an adult available to support and scaffold their computer interactions (Graham & Banks, 2000).

The results of the study suggest that, in order for teachers to support all children's success within these activity settings, they need to be aware of both the positive and negative peer discussion and behaviours that often accompany young children's collaborative interactions in computer use. Recognising this full range of possibilities up front empowers teachers carefully to structure these computer use activity settings for success. Watchful facilitation of collaborative activities during computer use provides opportunities for teachers to support constructive behaviours while preventing unfavourable actions from taking place, thereby reaping the fuller benefits of using technology to support children's literacy development.

My findings lead to two suggestions for how the effectiveness of young children's collaborative/social interactions during composing can be enhanced. First, the observed variability in partners' effectiveness at negotiating turns and control reveals the need for teachers to model prosocial, effective ways to engage in collaborative social interactions. All the children in this study varied in their effectiveness at negotiating control of the tool, turn taking, and extras. Teachers can assist children to negotiate control by modelling behaviour such as how to share control of the computer, request information from peers, acknowledge other's requests, evaluate products rather than partners, and incorporate ideas from all participants. Modelling how to share control of the computer may be particularly important for young children, who have limited social skills. Providing this assistance may reduce the difficulties in transfer of control observed by Daiute and Dalton (1993) and will facilitate inclusion of low status members, who are less likely to have the power to secure a turn.

One way for teachers to support the development of children's turn-taking skills would be carefully to observe the various ways children negotiate the process of turn-taking prior to intervention. Teachers could then select effective turn-taking strategies and make them explicit to all children within a class discussion. After drawing on observations of children's experiences, teachers could extend the discussion by introducing alternative turn-taking strategies and asking children to suggest additional approaches.

Encouraging children to request information and acknowledge others' requests is critical for them to support each other's learning. By showing children how to maintain a focus on evaluating the product rather than the person, teachers can curtail the emergence of defensive and negative behaviour. Emphasising the importance of incorporating ideas from all participants may diminish the tendency for high status individuals to dominate the activity, while low status children are being blocked from participating.

Second, this study also suggests that computer use can provide a context for collaboration, co-operation, and a positive learning environment between children, or between children and adults. However, this will not necessarily happen just because the computer is present in the early childhood education setting. Practitioners or teachers must be conscious of the kinds of learning interactions they would like to occur in the context of computer use including between adults and children, or between children, and adopt pedagogical strategies to support these.

From a socio-cultural perspective, collaboration with others provides activity settings within which children are able to participate in social and cultural activities beyond their capabilities. With assistance from others, discussions can promote growth because during interaction students can exchange perspectives and demonstrate patterns of reasoning. As students work together, there may be opportunities to support each other in carrying out tasks that may be beyond the ability of one or both students. They may automatically adjust their language to fit within their partner's understanding or ZPD as a teacher would. Positive interdependence results in promotive interaction and is critical to cooperative learning (Johnson & Johnson, 1998). Interaction is required for students to work together to produce a joint product.

The findings of the study also revealed that social relationships are important in the context for learning. Each child has strengths or interests that contribute to the overall functioning of the group. When children have opportunities to play together, work on projects in a small group, and talk with other children and adults, their own development and learning are enhanced (Ani and Lan, 2/11/2005, p.208; Wani and Athirah, 2/11/2005, p.208; Jamil, Syida and Farhan, 4/5/2006,p.251) Interacting with other children in a small group provides a context for children to operate on the edge of their developing capacities. The learning environment enables children to construct understanding through interactions with adults and other children (NAEYC, 1996, p.10)

Socio-cultural theory emphasises that development requires interaction and the presence of support from a more skilled partner. My findings suggest that even with minimal adult involvement, children exhibit many constructive patterns of interaction while composing collaboratively on computers (Wong and Gafar, 19/5/2006, p.255). Young children interact while composing together in a highly task-focused manner, rarely digressing from conversation related to their composing activity. They also rely on each other as resources when they have questions about content, writing mechanics, or tool use. Thus, within their collaboration, the children in this study did provide each other with the scaffolding that is considered critical for development. (Dina and Zaidi, 11/10/2005,p.255; Khalid, Putri and Naqib,11/5/2006,p.252) Yet the children's support often consisted of direction rather than instruction, with explanations and elaborations seldom provided.

As computers are becoming more commonplace in early childhood classrooms, and teachers are increasingly incorporating technology into their literacy curricula, the need to understand how to optimise children's collaborative interactions around computer activities is becoming more important. The ratio of children to computers within classrooms and across schools often makes it necessary for teachers to group children when involving them in computer activities. Additionally, many teachers view the social interaction of group work as important in computer use. My findings suggest that in order for teachers to support all children's success within these activity settings, they need to be aware of both the positive and negative peer discussion and behaviours that often accompany young children's collaborative interactions. Recognising this full range of possibilities up front empowers teachers carefully to structure these collaborative activity settings for success.

With regard to the children's interviews about their preference of "playing with a partner" or "playing alone", most children responded that they prefer to work with peers than to work alone. The result is consistent with the NAEYC's statement on computer environments in early childhood education, which stated that children choose to work with peers at a computer centre. When asked the reason why they preferred working with a partner, a large percentage of the children perceived the partner as a helper. They said that the partner provides the assistance they need. One of the children said, "Nobody will help me and give me some ideas, if I play alone". On the other hand, some children preferred to work alone because they saw a partner as a competitor. They preferred working in a quiet computer environment without being bothered (See section 6.3.4). Meanwhile, the child's relationship with the peer determined whether or not they like to work with the partner. Many children seemed to like to play with a good friend instead of a person whom they could not get along with. These impressions show some consistency with Medvin et al. (2003) who reported that the children seemed to enjoy working at the computer together and gradually needed less guidance from an adult. The computer became a "peer-led centre":

> Children spontaneously offered assistance to their friends in changing the game and exploring the programmes. The children helped each other play new games as well. Some students had the same games at home and were able to assist their peers. At other times they simply problem solved until they found the solution (Medvin et al., 2003, p. 16).

The teachers' comments about the children's social interactions suggest that the children were unconcerned about who was using the computer with them, and that usually they were cooperative when waiting for turns. These impressions show some consistency with Muller and Perlmutter's (1985) finding that active sharing and turn taking occurred among 4 and 5 year old children using computers. It is likely that adult involvement and initial planning helped here. The baseline phase of the study allowed the teachers some time to think about management strategies. Furthermore, the higher incidence of the children asking an adult for help suggests that there is an increased need for teacher involvement and support when microcomputers are introduced to early education settings, in order to help children learn to solve problems and develop cooperative learning strategies. The teachers' comments imply too, that ongoing teacher intervention may be necessary if girls and boys are to have equal access to the computing experience.

Each individual child's working style can affect his/her peer interaction at the computers as well. For example, boys are more likely to explore and experiment while using computers, while girls were found to be more supportive of each other (Deutscher, 1999). The individual working styles can also be seen in the children's perception of working with a peer. Some children who are more independent prefer to play alone (Zaki, 19/10/2005, p.250) on the other hand, some children prefer to work with a peer to provide support or to give assistance to the other (Dina and Ani, 14/10/2005,p.206; Yati and Tina, 18/10/2005,p213; Mohar, Jasri and Salima, 10/5/2006,p.252)

8.2.2 What kind of interactions take place between teachers and the children during play with the computer?

Teachers' roles and teachers' attitudes played an important role when children were using the computer. The success of technology in educational settings does not rely totally on having the latest hardware, graphic software, multiple peripherals, and a colour laser printer. All the gizmos and gadgets in the world operating in tandem cannot work miracles by themselves. "It is people who make technology powerful" (The Alliance for Technology Access, 1996, p.8). It is well recognised that the teacher is central to the successful integration of computer usage into the early childhood classroom (Badgett & Snider, 1995; Haugland, 1999, 2000; Liu, 1996; Wright, 1998).

In examining computer usage in the early years classroom, it was clear that teachers exhibited various instructional methods. In classroom A, C and D, all the teachers displayed active roles in the computer area. From the classroom observations, it was obvious that all the teachers constantly assisted children while they were playing with the computer. As mentioned before, the teacher-child interaction in the classroom is also considered as scaffolding. This finding supports the Vygotskian concept of the effectiveness of processing information through social interactions between adults and children. Vygotsky proposed that adults act as mediators who are responsible for pacing a child's learning process (Vygotsky, 1978). The way a teacher explains events or processes are considered the central element in guiding a child's learning with a view to positive learning outcomes. Furthermore, Vygotsky viewed learning as socially constructed, where children learn what is necessary to participate within their society and culture through interactions with cultural tools that are mediated by peers and adults. In the 21st century these cultural tools include digital as well as paper-based communication and information tools, artifacts, and media (Downes et al., 2001, p. 4). All the teachers' displayed this type of scaffolding in the computer-learning environment in these classrooms (Ayuni (Teacher) and Azhar, 27/10/2005, p222; Field note, 4/5/2006,10/5/2006)

It made children's computer experiences beneficial and comfortable. More important, the children in these classrooms performed better in computer tasks and became confident. Most learning occurs when an adult is present and is able to interact with the child. "In the most effective (excellent) setting, the importance of staff members extending child-initiated interactions was also clearly identified. In fact, almost half of all the child-initiated episodes which contained intellectual challenge, included interventions from a staff member to extend the child's thinking" (Siraj-Blatchford et al.2000). Siraj-Blatchford et al. also reported that teaching and learning were most effective in settings where there were cognitive interactions, including those which lead to sustained shared thinking. Learning was also found to be most effective where there was frequent use of questioning techniques by adults, especially in the context of children's play.

The findings of the study indicated that, it is important for the adult/teacher to provide appropriate levels of assistance rather than arbitrary intervention. If the child is required to observe passively the superior skills of control and dexterity of the adult, they will inevitably get bored, feel powerless, become frustrated, and not have the opportunity to develop their own skills. Without sufficient assistance however, the child may feel frustrated in not being able to achieve what they want or they may feel inadequate and not want to use the computer in the future. Once young children have had initial assistance, it can be decreased progressively until the child is working competently with minimal supervision (Clements & Nastasi, 1993; Bredekamp & Rosegrant, 1994; Jones & Liu, 1997).

The findings of the study indicated that the teacher in pre-school B's passive role created the main problems at the computer area (See section 7.1.5.8). The foremost problems were that computers and software in her classroom constantly broke because children used them carelessly. The children often needed assistance while playing with the computers. Such assistance was only available when they asked for it. Practically it was difficult and distracting for the children to ask for the teacher's assistance every five minutes. In addition leaving children alone at the computer is considered developmentally inappropriate and may result in absence of benefits that computers could provide for children (Chang, 2001). In contrast in classrooms A, C and D, all the teachers displayed more active roles in the computer area. From the classroom observations, it was obvious that they constantly interacted with the children in the computer area.

The findings of the current study also found that adult directed activities often occur in relation to computer use. (See section 6.3.6 and section 7.1.6). Although the role of adult interaction is important for the development of young children, to enhance social benefits for young children, cooperative use of technology with peers is recommended. Without an understanding of the varied benefits of technology use for young children, early childhood teachers may not realise that child directed activities may also be used. Yost (2001, 2002) offered a variety of approaches and activities that teachers can use to provide opportunities for child-directed activities and computers. By providing a variety of opportunities across the day for child-directed computer use, children learn to use the computer as a tool.

The analysis of the observations of child-teacher interactions in computer environments revealed that children who operated computers with adult/teacher instruction improved their computer operation strategies, from trial-and-error to planning ahead, as opposed to children who operated computers without such instruction. The trial-and-error strategy was frequently used by all children at the outset of the study. They tended to respond immediately, following the presentation of the required task, and made many mistakes. Moreover, the mediation group children delayed their response to weigh possible solutions before entering their response, made a mental effort in order to choose the suitable response, and were aware of their working and thinking processes. The conclusion stemming from these data is that the integration of mediation in computerised teaching and learning at pre-school age facilitates the development of intelligent computerised learning environments. The attempt to define characteristics of effective teaching behaviour in computerised environments for young children may help clarify some of the necessary changes in the teacher's role in this environment, from a teacher who is a source of information to a teacher who is an instructor and a mediator of learning and thinking.

The findings of this study indicated that children who used computer game software with adult mediation completed their task more successfully than those who used computer game software without such mediation. These findings suggest that the combination of computer games software along with adult mediation has the most potent effect on the development of children's thinking. Based on this study, it may be concluded that although young children are able to use a variety of computer software and tools to suit their wishes or needs, these activities will enhance their thinking primarily if they are accompanied by adult mediation.

This study suggests that 4 to 6 year old children in educational settings were generally competent at forming and articulating specific likes and dislikes regarding computers. However, as some children responded ambiguously, careful, supportive questioning and probing are required when interviewing children in this age range. There were individual differences, but no notable age differences, in the extent to which the children enjoyed computing activities. Consequently, when microcomputers are introduced into early educational environments, younger children, in particular, might enjoy having adult listeners nearby.

Finally, the findings of the study reveal that the early childhood teachers also play an important role in facilitating the interactions between children during various classroom activities. This is as easy to do when children are working together on the computer as when they are playing a game or with other learning materials in the classroom. Effective use of technology in the education of all young learners is dependent on the manner in which it is used. In providing the support that young learners require in crossing the bridge from being dependent to more independent learners, technology offers a strong foundation (Badgett & Snider, 1995, p. 104).

8.2.3 How do pre-school teachers think the computers are being integrated into pre-school classroom?

a) Teacher attitudes toward the computer.

It is almost impossible for teachers to integrate computers successfully without acknowledging the potential benefits of computers for children's learning and development, and dedicating time and effort to this cause. Teacher's willingness and positive attitudes are key elements in the computer integration process (Bredekamp & Rosegrant, 1994). Baeur (2005) in his study found that the teachers who were highly educated and skilled with technology, were innovative and adept at overcoming obstacles, but that they did not integrate technology on a consistent basis as both a teaching and learning tool. Two key issues were that their students did not have enough time at the computers, and that teachers needed extra planning time for technology lessons. Other concerns were out-dated hardware, lack of appropriate software, technical difficulties, and student skill levels. However, the teacher's dedication and willingness to integrate computers into classroom were the missing elements in these four classrooms (See section 6.3.2 and section 7.1.2)

In conclusion, "teachers' actions largely influence their students achievement" (Bitter & Pierson, 2002). Therefore, early childhood teachers' knowledge and attitudes are a vital part of children's learning with computers and computer software.

b) Limited teacher knowledge about computers

As discussed in section 6.3.1 and section 7.1.1, all the teachers pointed out that lack of training, resources and time were the main reasons for their failure to use the computer in their daily activities in their classroom. Along with this issue, teachers' limited knowledge about computers played an important role for not integrating computers into their daily activities.

Although all teachers' beliefs about computers varied across classrooms, they all had limited knowledge and understanding about the potential contributions of computers to children's learning and development. For example, teachers in classroom B recognised computers as a beneficial tool for children's academic learning, claiming that children needed to learn basic computer skills before entering formal education (Section 7.1.2). For this reason, she focused on teaching children the basic computer skills such as turning the computer on or off and loading or ejecting the CD. On the other hand, the teachers in Classroom C conception of computers focused on the children's emotional interests. They believed that the computer was part of their programme because children were interested and loved to play with it. They rarely had an academic agenda for the children's computer usage. Jamilah from pre-school A, for example, emphasised that she was against the idea of using computers only for academic enrichment purposes.

(Interview with Jamilah, 2/11/2005). Exclusive academic use of computers was also found inappropriate by NAEYC, (1996). Different from Jamilah, Mariam from pre-school D especially believed that computers contribute to some children's confidence development.

It is at this point that, before computer use becomes widespread in the pre-school classroom and across the curriculum, teachers have to be convinced that using computers will result in better learning outcomes for children than result from using traditional methods with which teachers are familiar. In addition all teachers need to be supported by providing greater access to computers, offering professional development programmes and by making technical support accessible to them. Many teachers are still sceptical about the rush to use computers, considering this to be just one more in a series of educational bandwagons.

There is still a need to prioritise more regular training and use of computers by all teachers, as well as training in the appropriate pedagogies for ICT learning (See section 6.3.2.1 and 7.1.2.1). When it comes to learning with computers, it is possible for teachers to abandon all their hard-won professional knowledge about children's learning; to forget about interactive and constructive learning, and adopt or accept didactic programmes; to allow exploratory learning to be replaced by rote-learning; and to assess through simplistic checklists rather than through the more complex and holistic criteria that are used in other areas of learning. High-quality training and ongoing support for teachers will allow them to reverse this tendency and begin to evaluate software by appropriate criteria (BECTa, 2000; DATEC, 2001; Haugland & Wright, 1997), to use the technology in tandem with other tools, and to create integrated learning environments (Downes, Arthur, & Beecher, 2001).

The findings in the current study reveal that educators in childcare settings need training in the provision of developmentally appropriate use of technology for pre-school children (See section 6.3.2.1 and 7.1.2.1). As Darling-Hammond, Chung, and Frelow

(2002) demonstrated, teachers who received their education in a high quality teacher education programme had higher efficacy in instructional design, lesson delivery, classroom management, and understanding the diverse needs of learners. However, the study by Darling-Hammond et al. also demonstrated that all teachers, regardless of the type of preparation programme they completed, felt a low level of efficacy regarding the application of technology in the classroom. Therefore, teacher-training programmes are neither introducing nor adequately preparing educators to implement various types of developmentally appropriate technology in learning.

These classrooms exemplified the common problems related to computer use in the early childhood classroom. The fact of simply placing a computer in the classroom has not ensured the integration of computers into the classroom (Section 6.3.1 and section7.1.3). The computer integration and use by the teacher and the children will require teacher dedication and training, adequate equipment and support.

The teacher needs to be very computer literate and to possess "effective knowledge of how to make technology developmentally appropriate for young children" (Badgett & Snider, 1995, p. 101). Recognising teachers as integral to successful technology use in the classroom, Anderson, Foertsh, Hawkes, McNabb, Raack, and Valdez advocate for "new kinds of professional development assistance" (1999, p. 18), as well as "shifts in both curricular and instructional goals (p. 9). They recommended that, "Computers should be used less for drill and practice and more as open-ended thinking tools and content resources. Teachers need to buy into this teaching style and then learn how to use the technology to support it" (p. 9).

c) Lack of Time

The findings of the study found that, all the teachers point out there is a lack of time for both teachers and children to learn and experience the computers. They complained most about lack of time to experiment with the computer in the classroom (Section 6.3.1

and section7.1.3). Haugland (2000) believed that children should be provided with plenty of time to experiment and explore on the computer and that teachers should intervene only when children appear frustrated or reach an impasse with the programme or with each other (Haugland, 1999). As with any new learning situation or material, the children should not be forced to "play" on the computer, but should be allowed to gradually become familiar with it, as would be done with another machine or a classroom pet. It is also extremely important that the teacher provides equitable time for all students to experiment with the technology and not view the computer or a particular computer programme as more suitable for one gender or the other. NAEYC (1999) recommends that technology be appropriately and successfully integrated into the classroom environment where children can use it regularly. For optimal benefit, young children must have a choice regarding when and how much time they spend at the computer.

Besides that, finding the time to keep abreast of the rapid growth of computer technologies and effective strategies to use them was mentioned frequently by teachers. The newer computer products are more complex and sophisticated and often require more time for teachers to use them effectively. For example, one teacher noted, "I need time to explore programmes myself."

A teacher's philosophical resistance to using computers can be an important issue for not introducing computers into their daily activities. Therefore, in order to make computer integration a success teachers need to believe that when used appropriately computers are a valuable resource, enriching children's growth and development (Haugland, 2000; Hohmann, 1994; Morgan and Shade, 1994). It is critically important that teachers carefully evaluate the role computers will play in children's live (Haugland and Wright, 1997). The role of computers in the classroom is determined by teachers (Bredekap & Rosegrant, 1994). Although all the teachers recognised some of the positive effects they were overwhelmed by the technical problems of the computers. They also noted that they were frustrated about the computers' problems and watching the children in other centres was more important than fixing the computers.

d) Lack of training

Another respondent expressed concerns that they did not have enough training in how to use technology with young children as well as how to integrate the computer into the curriculum. As one teacher stated, "We need assistance and training in teaching and adapting the software for the children." Another teacher noted, "My computer skills are limited. It would be nice to have some help in using my resources to their full potential." Others expressed a desire to have more experience in integrating the computer into daily lesson plans and more training in the use of adaptive equipment. Appropriate use of these tools in turn depends on the skill and knowledge of the teachers, and the "developmental appropriateness" of the technologies (or applications of those technologies) for the children in question: As (Siraj-Blatchford & Whitebread, 2003, p.6) stated:

> "The use of ICT in the early years has the potential to enhance educational opportunities for young children. It can be applied in a developmentally appropriate manner to encourage purposeful and exploratory play. It can encourage discussion, creativity, problem solving, risk taking and flexible thinking, and this can all be achieved in a play-centred and responsive environment. However, all of this does demand that practitioners are well trained and skilled in the appropriate uses of ICT with young children" (Siraj-Blatchford & Whitebread, 2003, p.6).

The findings in the current study reveal that educators in these pre-school settings need training in the provision of developmentally appropriate use of technology for pre-school children (See section 6.3.1 and section 7.1.3).

The findings of the study also indicated that all the teachers in the four case studies have limited support to assist them in the selection of appropriate software, or for consultation regarding the integration of technology into their classrooms. All the teachers noted that they have little or no access to external support that could facilitate the selection, maintenance, and trouble-shooting of computers on site. Recent research indicates that early childhood teachers support the integration of computer technology in their classrooms (Specht, Wood, & Willoughby, 2002; Wood, Willoughby, & Specht, 1998) but may require more exposure to computers, and more training, in order to provide greater confidence in their ability to use it effectively and comfortably (Wood, Willoughby, Specht, Stern-Cavalcante, & Child, 2002). In addition, all the teachers in the study perceived lack of training and comfort with technology, coupled with limited technological support resources, which may have important implications for the selection of appropriate hardware and software for the children they supervise.

e) The Need for Technical Assistance

Often overlooked is the necessary proportional increase in the need for technical assistance or support staff as the number of computers in the pre-school classrooms increases. The technical support must be highly skilled and have an understanding of the needs of the educational environment.

This study has clearly shown the need to have technical assistance or support staff in each case study (See section 6.3.1.4 and section 7.1.1.4). The support staff needs to be flexible and perceptive in understanding what sort of support is wanted in a situation, i.e., "fix and go away" or "show me how to fix so that I can learn for the future". In addition it is important for the technical assistants to work closely with those providing computer or ICT professional development as they see first hand the skills and knowledge of the staff they are working with and know the professional developmental needs required.

Furthermore, all the teachers identified the need for technical assistance as well as more time to obtain knowledge, skills, and information about computers. This could be due to the fact that technical assistance often is not readily available at their schools. Even though many of the respondents reported that their school districts had a technology specialist to assist them, backlog of referrals, multiple tasks, and little follow-up due to time constraints may place limitations on the accessibility of the specialist. As one teacher reported, "When computers go down or software locks up when children are on the computer, there is no one available at this school to remedy the problem and this leads to frustration on our and the children's part." Therefore, it is important for the technical support to work closely with those providing professional development as they see, first hand, the skills and knowledge of the staff they are working with and know the professional development needs required.

8.2.4 How do teachers adapt the curriculum to incorporate the use of the computer into pre-school activities?

a) Curricula of the classroom determines Computer Usage in Classrooms.

In terms of curriculum, all the classrooms in this study adopted the curricular philosophy that children learned through play (Malaysian Pre-school Curriculum, 2003). There was a strong connection between curricular priorities and how computers were used in this classroom. It is also recommended that pedagogical approaches were needed to shape the use of computer technology (Downes, Arthur and Becker, 2001). In these classrooms, decisions related to the computer technology were affected by the centres' overall curriculum.

For computers to have an impact on children's learning, computer activities need to match with children's educational goals. When computers are integrated into the curriculum, young children are provided with a set of tools to assist them in achieving developmental goals across integrated content areas. Given the vast array of adaptive devices, any child can use a computer.

The findings from this study appear to support those from existing research indicating that the use of computers in early childhood education are influenced by four main factors, including educators' level of computing knowledge, appropriate software selection for young children, access to up to date technology, and issues associated with the location of a computer within the early childhood classroom (Filipenko & Rolfsen, 1999; Haugland, 1997; Judge, et al., 2004 and Sandberg, 2002). This particular set of factors holds implications for how effectively computers can be used in early childhood education to support children's learning and development.

Whilst each factor is of importance alone, combining the four factors suggests that effective use of computers in early childhood classrooms involves reflection on their relationship to the existing curricula in relation to the various levels of computing skill held by educators. In addition, access to current and reliable computers (and associated technologies such as digital cameras) is crucial to ensure that children and educators are not frustrated in their attempts to use the technology as an additional tool or learning medium in the classroom. As a set of findings, these factors may be useful to those educators planning to integrate a computer into their classroom in order to ensure that the presence of the computer serves to support children's learning experiences within the context of early childhood education.

Patterson (2004) suggests that: "in order to use computers and other ICT in such an "integrated" way, early childhood educators need to be familiar with contemporary learning theories and recognise how these can be linked to the use of ICT."

b) Limited computer use in the classrooms.

Through observations, interviews and documents collected from the four classrooms, it was clear that computers exist as a part of play materials in these four classrooms rather than being in their daily activity or as a part of the curriculum. In all the classrooms, all the teachers revealed that the computers were not used as a part of their daily programmes. In all the classrooms, the computers were only used during children's free playtime along with other play materials that were arranged in advance for children's play. Therefore, the computers served one purpose: game playing. Simply setting up the computer and providing various software does not constitute an integrated use of computer technology (Davis & Shade, 1999). The computers were placed in these early childhood classrooms as an add-on or extra resource for children to play with rather than serving as an educational tool that helps children and teachers achieve their educational and personal goals (Pierce, 1994).

The integrated use of computers in early childhood classrooms is defined as using computers in any numbers ways in which computers could support instruction in a wide variety of curriculum areas (Davis & Shade, 1999; Haugland & Wight, 1997; NAEYC, 1996). Particularly, computers can be meaningfully integrated into classroom projects and activities. In this classroom, they had themes such as the World around us, Transportation, Colours, and Festivals. Children could explore these themes with the help of computers and provide reading, writing, math or science activities. Unfortunately, computers existed only as a part of the free play materials in these classrooms.

c) Why have these classrooms not integrated the computers into their daily curricula/programmes?

O'Hara (2004), explained that the barrier to ICT use in early childhood education could include: teachers' limited training opportunities in the use of ICT; insufficient equipment or funds to buy equipment; absence of on-site technical support; or a lack of time to develop ICT-integrated teaching or learning activities (O'Hara, 2004). In relation to this, the teachers in all classrooms pointed out that lack of training, resources and time were the main reasons for their failure to integrate the computers into their classrooms. As one of the teachers reported, lack of teacher training, lack of children's interest, and children's and teachers' frustration with technical problems were the major reason for not integrating computers into the classroom.

Another reason reported by the teachers regarding their use of a computer in the early childhood classroom was that a computer had become available, and this was viewed as a useful opportunity to provide the children with an 'extra' experience. The decision to use the computer was not necessarily related to issues of pedagogy, technological currency, or even skills acquisition. The computer was considered "just another thing to 'do'", with'"nothing else" except its sudden availability supporting its inclusion in the classroom. A similar reason was expressed by a teacher who also described the positioning in the programme of a donated computer as an "extra" experience for the children.

In relation to this, while the computer may be present in a classroom, its use and benefit to the children was not necessarily considered in terms of the educator's beliefs about the purpose of early childhood education and, by extension, was unlikely to be incorporated effectively into the curriculum. As Haugland (1999) notes, without appropriate professional support educators are unlikely to understand how the computer can be integrated into the existing curriculum, leading to it being seen as an extra or reward experience (Clements, Nastasi & Swaminathan, 1993). Consequently, as was the situation for the 'technological currency' and the 'management directed' teachers, the computer experience was viewed as potentially external to the curriculum and those social, hands-on active learning experiences considered of importance to early childhood education (Brooker, 2003). In other words, while the decision to use a computer might be made on the grounds of technological currency, by management and/or by its perceived ability to provide an 'extra' experience for children, its ultimate relationship to the curriculum in terms of pedagogical appropriateness is not necessarily guaranteed.

8.2.5 How does the physical and spatial organisation of the computers in the classroom impact on children social interaction behaviour?

The following sections discuss the problems which emerged from the facilities available in these classrooms. Having and effectively maintaining a computer centre or computer area in the classroom requires more teacher input than having other learning areas such as house keeping, blocks or books. For example in all cases, the teachers arranged the house keeping area at the beginning of the semester, and they allowed children to play alone or with peers in those areas. They rearranged, added or removed some of the toys in those areas during the semester. The house keeping area was the most visited area in classroom (Filed notes from classroom A, B, C and D). All the teachers treated the computer area the way that they treated any play area in their classrooms. They arrange the computer area, established and left the materials for children's usage. However, the computer area was quite different from traditional early childhood learning areas because it required constant teacher time and input. In order to run a computer area effectively, teachers needed to select appropriate software, frequently assist children and maintain computers (Haugland, 2000; NAEYC, 1996; Hohman, 1990). All of these require more teacher time (See section 6.3.1 and section 7.1.1)

a) Hardware/software. (See section 6.3.1 and section 7.1.1)

The findings of the study show that the teachers were grateful for the computers they had, but many of the devices were old, slow, incompatible with new educational software, and lacked proper networking. There was little consistency in the array of hardware that the Minister of Education provided for each of the early childhood classrooms. In two pre-schools, the printers were not available in the classroom, and in another classroom the printers were limited and overloaded when the children tried to print their work. If a computer froze or had wiring problems, on call technicians were nonexistent. Trouble-shooting came from that person on the staff with the most technical knowledge. Of course, mention *hardware*, and discussion of money is not far behind. "Oh, if only I could get my hands on new simulation software. But there is no money for that," lamented one of the teachers as if for all of them.

A critical component of providing computer technology in the classroom is obtaining funding for purchasing, maintaining, and updating computers, software and peripherals. All the classrooms did not have the resources to invest heavily in computer equipment. The high cost of equipment has been a major challenge to the use of computers in early childhood education (Morgan and Shade, 1994). All the classrooms were totally dependent on the Ministry of Education in order to provide basic computer equipment.

One of the teachers stated that: “It is a money problem. We don’t have enough money to buy computer equipment and software” (Interview with Ayuni, 3/11/2005)

The software used during the study varied, as the researchers did not control for this variable. The teachers made available to children four to six choices of software daily, including a variety of literacy, math, and creative exploration programmes. All software available to children was recommended as developmentally appropriate and was selected according to developmentally appropriate guidelines (Shade, 1996). Several possible explanations exist relating to the lack of technology centres or software for play in these pre-schools, and the teachers were also concerned about the lack of appropriate software for the different developmental levels of their children. Results of this study suggest that even when computers were available for young children in child care centres, the implementation of the computers contrasted with the NAEYC's (1999) recommendations, as well as recommendations by Yelland (1999), for the proper integration of technology, which stated that play software must be available for young children. Findings from the current study, however, demonstrated that all the four classrooms offered software primarily for drill and practice of basic skills. These results support previous research that software is more often used for drill and practice than for play (Judge, 2001).

One of the teachers explained, "Not enough computers for all of my children and lack of appropriate software to meet the needs of all of my children." Another teacher's fear is expressed in the comment; "They get bored with the same software. Who's going to pay for new software?" Others suggested that being able to “try out" a programme before purchasing it would be helpful. One teacher commented, "I have ordered programmes that sound great in the catalogue but are worthless when they come in. I wish we could get free trials or samples." Related to this, teachers also noted concerns about limited software titles for children especially in the Malay language.

The results showed that, although the teachers in this study stated that they do not have any criteria or any training course on how to choose the software, they identified a number of important characteristics when selecting software for young children. Ease of use, or the software being user-friendly, was the characteristic mentioned most frequently. This finding is highly consistent with those found by Haugland (1997). Other important characteristics include colourful graphics and reinforcing sound, fun and entertaining, and developmentally appropriate. In fact, all the respondents indicated a desire for more developmentally appropriate software to be designed for young children at the pre-school stage.

In conclusion, "teachers' actions largely influence their students achievement!" (Bitter & Pierson, 2002). Therefore, early childhood teachers' knowledge and attitudes are a vital part of children's learning with computers and computer software. Computer software is a "direct contrast to traditional programmes where the learner is often passive and the teacher the conductor of content and actions" (Yelland, 1999). Consequently, early childhood teachers' familiarity and knowledge of computers software is vital if technology is to be educationally and developmentally appropriate for young children in their future classrooms (Davis & Shade, 1994; Hoot & Kimler, 1987). The choices early childhood teachers make when selecting and evaluating computer software for their students are vital for ensuring developmentally appropriate activities and learning (Haugland, 2000b; Buckleitner, 1999). Therefore, preparing early childhood education teachers to select appropriate software and uses for computers software is crucial if technology is to help maximise each child's learning. Developmental software must provide enough flexibility to "match the child's current level of understanding and skills, while growing with the child" (Haugland, 1997a, p. 133). The NAEYC (1996b) recommended the use of software that "engages children in creative play, mastery learning, problem solving, and conversation" (1996b, p. 12).

b) Equal access to the computer (See section 6.3.1 and section 7.1.1)

The National Association for the Education of Young Children's position statement on Technology and Young Children (1996) supports the need for equal access to technology for all children and calls for attention to be paid to eliminating gender stereotypes. A change in attitude is necessary in order to ensure that girls are not deprived of educational and professional opportunities and advancement in the future. The goal is not to make the computer more accessible and attractive to girls than boys, but to ensure that this tool is available to all students in the school (Fisher, 1984). Both girls and boys will benefit from computer opportunities. From the observations, it may be concluded that in all classrooms, boys and girls use the computer equally and frequently.

According to Linn (1999), as educators, the teachers need to be aware of the "harmful gender messages contained in fluffware (stereotyped software for girls)" (Linn, 1999, p. 16) and its detrimental effects on young girls. Since software programmes transmit messages about activities, status, and occupational roles that girls and boys can assume, programmes like Barbie's hairdressing salon reinforce sexist messages and perpetuate sexist attitudes and behaviours. From a constructivist perspective, therefore, there is a need to "reorganise pedagogy to honour women's ways of knowing/viewing computers and technology so the practise of technology is no longer male dominated" (Christie, 1997, p. 147). Careful evaluation of software programmes for elements of gender bias is essential before programmes are selected for use in the classroom.

The role of teachers in breaking the pattern of establishing sexist stereotypes and behaviours in young children is crucial. By increasing teachers' awareness of gender bias with regard to computer usage, necessary changes will be initiated. For the changes to be successful, it is essential to provide young children with positive experiences before biases have set in. A proactive rather than a retroactive approach to dealing with biases will prepare all children to be competent users of computer technology in the 21st century. Girls' increased access to technology will result in more effective learning time at computers and the development of computer related skills.

8.3 Major challenges to Malaysian Pre-schools from the principals perspectives

This study found that although both of the principals interviewed were enthusiastic about the integration of ICT, they were constrained by the lack of qualified teachers, time, funding support, software, technical support, room, and IT literate parents. Similarly, Li (2005) found the four major barriers to the integration of computers into pre-school classrooms were: underqualified teachers; lack of curriculum experts and their guidance; shortage of resources for curriculum development; and neglect of ICT by school management. It seems that most Malaysian pre-school teachers are in an urgent need of training.

The findings remind us of the important influences of societal, cultural, and contextual factors that might bring up these challenges. Berk (2000) pointed out that Bronfenbrenner's ecological system theory can be used to define a framework to understand the important influences of societal, cultural, and contextual factors and their interactions. At the microsystem level, for instance, this study found that a teacher's qualification was the principal factor impacting the integration of ICT. This finding is in line with Pelgrum and Plomp (1996), who found that the lack of IT literate teachers and the inadequacy of existing training were significant obstacles to the integration of ICT in schools. The majority of early childhood educators in Malaysia have little knowledge of or skill with ICT, and none of them received training in using ICT for teaching until 2002. Weak teacher qualifications will inevitably put a ceiling on ICT integration, and will result in some implementation difficulties. As a direct result of this, the principals in this study reported certain difficulties encountered in preparing their plans. Another concern at the microsystem level was the time limitation caused by the overloaded curriculum. The principals reported that their curriculum had already been overloaded, leaving no room for ICT implementation. For instance, the majority of Malaysian pre-schools offer a half-day programme, between 9:00 a.m. and 12.30 pm. The 3 hour programme includes theme teaching; group activities; English time; Malay language lesson; art, music, and physical activities; classroom work; and so forth. Hurried children and their hurried teachers often run out of time to catch up with the hurried schedule. This time limitation might have already made the integration of computers particularly difficult in Malaysian pre-schools.

A major concern at the mesosystem level was the lack of ICT input (including hardware and software). This study found that all the pre-schools lacked updated hardware and good educational software, and the few good types of software were usually presented in English and from a Western context. Therefore, most of the software could not be used to extend or enrich children's learning in a cohesive way, and none of it could be integrated directly into the early childhood curriculum. Nevertheless, neither local IT companies, nor their designers have professional knowledge of early childhood development. That is why some participants in this study expressed their concerns about the pedagogical inappropriateness of the software.

In the Malaysian principals' views, in-service training was the major solution to the challenges facing computer integration. This finding is in line with other studies that have emphasised the importance of staff development (Dupagne & Krendl, 1992; Leung, 2003; Ryan, 1993; Tsitouridou & Vryzas, 2004; Wood & Bennett, 2000). Interestingly, most of these solutions were, in their nature, a kind of "outsourcing" approach, asking for further involvement from government (fund-raising), parents (IT volunteering) and primary schools and community (sharing ICT resources). This implies that the educational authorities and communities need to do more to facilitate the integration of computers into early childhood education.

Although these findings are just culturally bounded understandings of the Malaysian principals' views on computer integration, some of them may well be shared with other nations, such as in-service training being the pivotal solution, along with parental involvement, governmental support, and community collaboration. However, well-designed, cross-culture comparison is required to extend this study and to further understand the cultural differences in effective implementing strategies. In this connection, this research will not only contribute to the understanding of early childhood education, but also open a new window for cross-culture studies on the integration of computers into pre-school classrooms.

8.4 The Contribution of the Research

As outlined in the aims/objectives and research questions (see section 1.2) and the significance of the research (see section 1.3), the nature of my study allowed me to see how the computers were used in Malaysian preschool classrooms. Accordingly, the researcher is able to make some suggestions for early childhood teachers and researchers to consider in relation to computers and young children in an early childhood setting. In the researcher's view the findings of the study could be of value to those who are either directly or indirectly concerned with the education of preschool children.

The researcher realises that the leaders in education in Malaysia are concerned about the status of technology in Malaysian schools, and wants to see all students from preschool to higher levels of education have access to learning computer technology that can empower them in the 21st century. However, experience with the observations in this study demonstrates that teachers must be prepared to use that technology effectively before computers can be placed in all Malaysian preschools. The information provided by this research is important as a starting point for policy makers to prioritise areas in which to concentrate innovative efforts in integrating technology into the schools in Malaysia especially in preschool classrooms. Generalisation of the results of the research to other emerging or third-world countries may also be useful, with careful examination of the differences in those countries' culture and status, because this research shows that key administrators and classroom teachers in one such country recognise the importance of educational technology for the empowerment of their students in the global economy. The researcher believes that the world is a global village, and that results from Malaysia can be used to recommend policies and implementat plans for both developed and developing countries with similar needs, and committed citizens who are ready to learn and go forward with emerging technologies. The opportunities for bringing these students into the 21st century workplace with technological literacy and confidence in their abilities to participate in the workplace are in existence and now stakeholders need to find the resources and methods to get them to the new generation of technology users.

8.4.1 Implication for further development of computer use in Malaysian Early Childhood Education

The findings of this study suggests that further development of ICT and particularly the use of computers in Malaysian early education should promote computers as a tool for enriching the teaching and learning environment in early childhood education. Decisions about how to use this tool should be consistent with the principles and goals outlined in the Malaysian Preschool Curriculum (1996, 2003). Furthermore, practitioners or teachers need to understand and make good use of computers to support children's learning, to communicate with others, and for their own learning. Effective initial teacher education and ongoing teacher professional development should be considered as key tools for supporting the development of practitioners' understanding. Features known to be effective for professional development and teacher education offer a useful basis for identifying approaches to such professional support for ICT (Mitchel & Cubey, 2003).

8.4.2 Implication for Malaysian Early Childhood Education Pedagogy

Most of the teachers in today's schools grew up before, and indeed were trained before, the advent of computers in children's lives. Logan (1995) argues that these teachers cannot fully comprehend the changes or the implications of these changes, because they view them through the eyes of a past era. As schooling cannot wait for the future generation of teachers who have grown up with these new domestic and other electronic technologies, education systems need to have strategies to help teachers recognise these changes, come to grips with them and even exploit them in ways which enhance children's learning.

The failure of preschool teachers to respond to the challenges of the new technologies and the possibility of 'new' children will increase the alienation these children feel between the world they experience in and outside school. Their 'outside the school' world of leisure, entertainment and informal learning will be increasingly based in the electronic media while their classroom world of formal learning will continue to be embedded in print. As well, the newly emerging capabilities that these children bring to their learning outside of school will continue to be ignored inside school.

By providing a well-grounded insight into children's 'live' experiences and activities with computers, this study can contribute to the development of strategies to reform the Malaysian preschool curriculum and activities. This will allow educators and media pundits to move away from strategies based purely on speculation and rhetoric and to use strategies based on verifiable accounts of what happens.

Finally, computer technology can help teachers develop new pedagogical models of teaching and learning, but teachers need to be exposed to the new understandings and new capabilities that are possible through the use of technology. Teachers need "opportunities to learn to be critical and reflective about their teaching" (Putnam & Borko, 1999, p. 1248). They need to collaboratively discuss "their beliefs about teaching and learning with one another, critiquing their own practice, systematically testing ideas and sharing their findings with each other" (Windschitl, 2002, p. 161).

8.4.3 Implications for teachers' professional development in Malaysian Early Childhood Education

Integration of computers into early childhood education brings some challenges for educators. Certainly teachers and administrators at first appear to be resistant to using computers in young children's education. When educator's theoretical misconceptions and misunderstandings are removed, other factors such as the high expense of computers, rapid changes in computer technology, parent's resistance, and the cost of technology training still play essential roles in successful computer integration in early childhood education. Full integration of computers depends on overcoming those challenges as well as improving teacher's technology training.

This research study illustrates how the children used the computer in their classroom. One of the issues raised by this dissertation is that teachers lacked adequate technology training for using computers in meaningful ways with young children. Most of the teachers complained that they did not have adequate training for using computers to foster children's education. Recent studies have discovered that even though teachers have adequate access to and technological support for their use of computers, they are still not using computers as frequently or effectively as they could be (Cuban, Kirkpatrick, & Peck, 2001; Levin & Arafeh, 2002). One possible reason can be attributed to the type of professional development they have been experiencing (Gibson & Oberg, 1998). Teachers voice concern about having insufficient knowledge about or experience with computers to use them effectively (Bilton, 1996; Love & Sikorski, 2000); Wood, Willoughby & Specht, 1998). The need for computer technology training to support the implementation of computers in early childhood education is widely recognised and is reaffirmed by the present research results. There is need for a professional development programme designed to support teachers' implementation of computer technology into the early childhood setting.

Ongoing training and staff development is imperative in order for teachers to become and remain informed users of advancing technology. Equally important, training should include not only how to use the technology but how effectively to integrate these tools into the existing curriculum. Several researchers (e.g., Bradshaw, 2002; Swan, et al., 2002) have attributed this lack of preparation to the current status of professional development initiatives for technology. New models of professional development are needed to help ensure the teachers' ability to use technology in a variety of settings and to express confidence in doing so. Bradshaw (2002) pointed out that, "The link between staff development and implementation is not automatic. Workshops and conferences, by themselves, do little to ensure that technology will be used in our schools and classrooms in ways that improve student learning" (p. 132). Therefore, it is important that the content of professional development (PD) for early childhood teachers should include how to use computer technology in their teaching. Furthermore, the content of the staff development should concentrate on giving a rationale for integrating technology. Being familiar with the possible benefits of technology on young children's learning and development is useful for teachers to support their own thinking and to provide them with tools for justifying their efforts to parents or fellow teachers.

The staff development programmes also need to focus on explaining hardware and software to teachers (Wood & Willoughby, 1999). Teachers often lack adequate knowledge about computers and software. Teachers who work with computer technology should be able to operate computers successfully. In order to accomplish this goal, staff development programmes should provide information about computers peripherals, such as the monitor, CD Roms, printers, mouse and memory (Specht, Wood & Willoughby, 1999). It is also essential to train them how to choose developmentally appropriate software. Teachers can use the available software evaluation criteria or create their own software evaluation system. To make these criteria clear, it would be helpful to demonstrate software that is developmentally appropriate and software that is developmentally inappropriate to allow teachers to make comparisons and provide hands-on experience (Specht, Wood & Willoughby, 1999). In addition, technology training that directly corresponds to teachers' contextualised environment is the key to promoting effective technology integration. Cole, Simkins, and Penul (2002) concurred, by noting, "Onsite (training) is best" (p. 443).

By educating teachers about pedagogical issues (as opposed to training them on technological issues), it is likely that teachers will begin to reflect upon their current instructional theories and tactics. Many researchers have found that when teachers successfully integrate technology into their classroom, the teachers find that they have taken on a new role in the classroom (Becker, 1994; Lunenberg, 1998). Many teachers find that the integration of technology encourages a student-centered, constructivist approach to instruction, where the teacher is more of a guide/coach and students are responsible for their own learning (Lunenberg, 1998). In effect, a successful professional development programme related to technology must focus not only on technology concerns, but also on the pedagogical concerns and how the technology is transforming teaching and learning.

The content of staff development in technology should include curriculum issues related to technology such as matching goals of the classroom with technology applications. Good and practical examples of technology applications should be exhibited in staff development sessions. Much of the emphasis of teacher professional development on technology to date has been on learning about computer-based tools and acquiring the skills needed to work with those tools. According to Green and O'Brien (2002), "staff development that simply shows teachers how to use computer applications and the Internet is not likely to help teachers to understand how to create situations where students engage in higher order thinking" (p. 5). This type of professional development does not lead to change in practice. Imel (2001) found that teachers used technology in ways that were consistent with their underlying beliefs about teaching and learning and that those beliefs and practices were consistent with the transmission and reproduction of their views of teaching and learning. Unless teachers are exposed to new ways of thinking about their practice and the role that computers can play in that changed practice, they will continue to use computers as an add-on to the ways they have traditionally taught.

Teachers are the main gatekeepers in allowing educational innovations to diffuse into the classrooms. Therefore one of the key factors for effecting an integration of computers in the school curriculum is adequate training of teachers in handling and managing these new tools in their daily practices (as cited in Collis et al., 1996, p. 31).

Laffey (2003, p. 378) concludes that:

> "...Field experiences, especially those that structure first-hand experience with children successfully using technology, are critical to (teachers) appropriating and overcoming resistance to using technology in teaching."

Finally, elements of such successful professional development as recommended by Heath et al. (2000) included providing experiences that "built on teachers' prior knowledge and provided opportunities for social interaction with colleagues," that focused on the "investigation of problems supported by technology that were relevant for teachers," and that allowed "time for reflection" (p. 61).

8.4.4 Implications for the Malaysian Department of Education

If the Malaysian Department of Education is serious about the importance of embedding computers into the preschool curriculum then it must take on board the findings of this study with regard to the following critical prerequisites to ensure that the use of these computers result in improved outcomes for the children's learning and development.

8.4.4.1 ICT skilled teachers

The Department needs to employ a workforce of teachers who have the knowledge and skills to organise the classroom and structure appropriate learning or activity task so that the computer can become an integral and valuable part of learning. This means giving teachers and support staff adequate and appropriate professional development time allocation in their work loads to develop the skills and knowledge to prepare technology rich learning environments. It means that the teacher training programmes need to prepare beginning teachers adequately with the same skills. The researcher would go as far to say that the selection criteria for preschool teachers should also include one based on ICT or computer skills essential to teaching and learning. As Bitter (1989) notes, "Colleges of Education must have programme requirements to insure adequate preparation for students to use the computer as a tool in their teaching" (p. 34).

Teachers need to understand and make good use of ICT to support children's learning, to communicate with others, and for their own learning. Effective initial teacher education and ongoing teacher professional development should be considered as key tools for supporting the development of practitioners' understanding. Features known to be effective for professional development and teacher education offer a useful basis for identifying approaches to such professional support for ICT (Mitchell & Cubey, 2003).

Finally, under the impact of the cultural change, infusing technology into the curriculum is indispensable. Teachers must recognise the magnitude of the change in order to adapt willingly. It is a trustworthy experience for any major changes to be successful that there must be a focus on the people first and the innovation second. In adapting to change, we also need to understand that institutional support must follow closely. It is crucial for teachers, especially in the toddler stage, to meet success in their initial forays into the realm of the digital world (Scoolis, 1999). When teachers feel supported, safe, and know where to go for help, their willingness will sustain the process and readjustment can become smooth, the efforts effective, and the outcomes fruitful.

8.4.4.2 Malaysian Preschool classrooms need an adequate infrastructure and technical support

Malaysian Preschool classrooms require adequate hardware, software, infrastructure and bandwidth to run the programmes essential to the children's activity programmes. In addition to this they need technical support that is able to maintain the infrastructure to a standard that allows teachers to get on with the job without being concerned whether the equipment is working or not. This study has shown very clearly that if teachers cannot rely on the equipment they will opt not to use the computers.

8.4.4.3 Curriculum documents reflect the competencies

A final recommendation is that the need for the preschool curriculum documents to specify a technological requirement. The Malaysian Preschool Curriculum Developer needs to develop policies to ensure that the above are met to at least minimum standards in all preschools.

The following quote from McKenzie gives a good analogy for what is needed to ensure that technologies are embedded into the curriculum. McKenzie (1999, p.4) uses a gardening metaphor to explain the stages required for technologies to be embed into the curriculum.

> "The soil *(the community of teachers and learners)* needs to be cultivated and fertilised *(Professional Development prior to equipment arriving)* prior to planting and the garden needs to be maintained and weeded *(support professional development, technical assistance etc. for when the equipment arrives)* for the plants to thrive".

8.4.4.4 Financial support

If the Ministry of Education is serious about embedding computers into the preschool programme, then they need to also be serious about the financial assistance to provide the types of support recommended. Recommendations from this study and from the literature (McKenzie, 1998) are for budget to split up in the following way:

33% on infrastructure
33% on IT technical support; and
33% on Professional Development (PD).

The above split up shows a commitment to all aspects of embedding computers and ICT into the teaching and learning programme by giving equal financial weighting to the infrastructure, technical support and PD. This should ensure that the technologies bought are both supported technically and utilised by teachers who have knowledge and experience in good pedagogical use of technologies. In addition the researcher would recommend that a percentage of this budget be set aside for future years to allow for updating of the technology infrastructure and software.

8.4.5 Implications for Practice

The findings in this study hold implications for software developers. Clearly, respondents would like more developmen*tally appropriate software designed for young* children. An additional concern is the need for more software that has options for adaptive input and output methods. Early childhood education teachers want software to: (a) be easy for children to operate, (b) expand so that children can be taught the important cognitive, language, critical thinking, and social skills, and (c) be engaging with colourful graphics, appropriate sounds, and interesting music. These characteristics expressed by respondents highlight critical areas of improvement for software manufacturers. Software should be designed so that children can use it. Off-the-shelf software should be accessible to the young children.

8.5 Limitations of the study

1) This has been a small study embedded in the culture of particular schools and school system. In addition, the study has focused specifically on computer use and implementation by teachers in the Malaysian Early Childhood Classroom. The outcomes of this study may have been different if it had been conducted in a different sociocultural context, or approached through a different methodology, e.g. action research. Limitations occur in any data collection and constraints must be accommodated. However, these limitations have the potential to provide the starting point for further research.

2) It is important to understand that the study was conducted as a particular time and that the computer, as a technology with its own history, is particularly characterised by its rapid rate of change and development. The rapid rate of changes of technology outstrips the time taken to engage in and write up a doctoral study. In this sense, the technology will always be ahead of the impact of any sustained study. By the time this thesis is read, new technologies will be available in schools and children will be exploring new ways of using them. However, in this study the most important contribution to new knowledge is the deeper understanding of the interaction between

children and computers and interaction between children and peers. Therefore the actual age of the technologies used is relatively unimportant. What is more important is how this interaction changes the behaviours and capabilities of the children and the implications of these changes for the preschool's curriculum.

3) It is also important to understand that, when considering the interaction between children and computers, we need to take account of the historical situation of the children's families and homes as well as the computer. In addition, there is a rapid increase in home ownership of computers. This ownership is not uniform across the socioeconomic and cultural boundaries nor across nations. Additionally there are also significant changes in the physical and social contexts of family life and in childhood.

4) The sample size children in this study are relatively small (46 children). Therefore, this study is restricted by the collection of data from only four classrooms. The more children involved in a study the more the power of the study would have been increased and more wide-ranging information and understanding would have resulted. In addition, this study was restricted to children of age 5 and 6years who have a fundamental background knowledge about computers, and all of the subjects are from middle-class families. Thus it makes it difficult to generalise the data to children who were from lower-class families that may have less access to computer resources. Nevertheless, some important observations have been made about children's interactions when using computers and teachers' attitudes to the implementation of computers into their classrooms.

5) And finally, in observational research, findings may only reflect a unique population and therefore cannot be generalised to others. There are also problems with researcher bias. Often it is assumed that the researcher may "see what they want to see." Bias, however, can often be overcome with training or electronically recording observations. Hence, overall, observations are a valuable tool for researchers.

8.6 Suggestions for future research

There are many areas for further research that could be derived from this study. The present study is just the beginning and should be considered as an invitation to other researchers to join in the investigation. The scope and potential for future research are great, and very necessary for the benefit of preschool teachers and preschool children in Malaysia and further afield. Some future research that could be considered includes:

1) The incorporation of the research in the framework of computer use limited this study to four preschool school sites; however, this proved to be beneficial by focusing the research on thick descriptions (Geertz, 1973) of the use of computers in these classrooms. Using only Government preschools for this study meant that the implementation of computer use and the investigation of preschool children's social interaction behaviour was restricted to the range of sociocultural school sites considered. A larger scale study is needed to cover variables such as the context across Government and non-Government preschools; and the socio-economic status profile of preschools and preschool culture.

2) Another area where further Malaysian research could focus is on children's and families' views and experiences in relation to computer use in early childhood education. Some international studies have looked at the relationships between children's home life and experiences, and how this may interact with their experiences with a computer in the early childhood education setting (e.g Brooker & Siraj-Blatchford, 2002; Downes, 2002). Besides that, there is much anecdotal evidence to suggest that ICT can play a role in increasing parental involvement in children's learning in the early childhood education setting (including involvement in planning and assessment), and enhancing teachers' understanding of children's home experiences, activities, and learning (Lee et al., 2002; Whalley et al 2001; Wilson et al., 2003). Further Malaysian research to investigate the role and use of computers in strengthening relationships between home and school could demonstrate useful practical approaches and also raise any issues specific to the Malaysian context. Research in this area should include investigation of children's and families' perceptions and experiences, as well as those of practitioners. Research is also needed to identify what differences in Malaysian

children's home and family experiences might be significant for planning for the use of computers in early childhood education settings. While there is some international literature in this area (Brooker & Siraj-Blatchford, 2002), research in the Malaysian context would be useful.

3) The findings of this study also lay the groundwork for future research to investigate gender differences among computer experts in preschool settings, patterns of computer use when programmes are explicitly related to classroom instructional themes, and the effect of giving children opportunities to choose among a variety of developmentally appropriate programmes on their progression through the identified stages of computer competence.

8.7 Conclusion

Vygotsky (1978) tells us children learn in order to communicate with and become members of their culture. In the present culture, facility in ICT environments is necessary for optimum communication. Indeed, computer communication is an important aspect of "social discourse" through which children come to understand the values and beliefs of their culture (Bowman & Beyer, 1994, p. 20). Computers have the potential to serve as "catalysts of social interaction" (Clements & Sarama, 2002, p. 1), thus supporting social development of children if used properly. This study has highlighted some significant issues in relation to the links between young children's social behaviours (exhibited through their interaction patterns) and the factors that appear to facilitate or inhibit such behaviours. Scaffolding is a term that is most often applied to Vygotsky's (1978) theory of learning, in which it is believed that cognitive development in children occurs through the interaction of a child with more capable members of the same culture, such as adults or more knowledgeable peers. The results of the research are intended for all concerned with preschool education to reflect and look into the existing practice and see ways in which it can be improved, not for the sake of adults but for the benefit of the children. It is also intended especially for education officers in charge of preschools to look further into the problems faced by teachers in preschools in carrying out 'learning through play with a computer' as envisaged in the curriculum guidelines. Finally it is intended for policy makers to provide adequate training for preschool teachers. It is also hoped that as a result of this study, the policy makers would review the curriculum guidelines for preschools in order to incorporate explicitly how 'learning though play' can be carried out to assist teachers, especially when it is in a new phenomenon in preschool education.

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Appendix I

Computer peripheral terms

1.Desktop computer/ PC, personal computer: a personal computer based on a microprocessor, small enough to fit conveniently into an individual workspace and designed to be used by one person at a time

2. Device: any peripheral or part of a computer system that can send or receive data.

3. Monitor: a screen, which allows the user to watch and interact with the computer.

4. Mouse: a common pointing device that senses its movement across a flat surface and transmits that information to the computer, typically to control the position of a cursor or pointer. A mouse is usually equipped with 1-3 buttons that also send signals to the computer.

5: Memory: the part of a computer that holds data. This usually refers to RAM (Random Access Memory, the standard operating memory of the computer).

6. Minimize Button: in a Windows environments, the button is in the upper right hand corner of the window. When clicked it reduces the window to an icon (in Windows 3.x) or a taskbar button (Windows 95 and 98) in order to display the desktop.

7. Keyboard: a data input device for computers; arrangement of keys is modelled after the typewriter keyboard

8. Cursor: a bright, usually blinking, movable indicator on a screen display, marking the position at which a character can be entered, corrected, or deleted.

9. Drill and Practice Software: a computer software programme, which is designed in a linear and fixed path. The designed pattern was repetitive to reinforce student's certain skills such as language, math, and science.

10. Open-Ended Software: a computer software programme, which is discovery-oriented and designed in a nonlinear and flexible fashion. Students have full control over the programme.

Appendix II

a) A Glimpse of Malaysian Education History

1) Razak Report 1956 and Education Ordinance 1957 - Consolidation Period

Formation of a single system of national education
Recognition of the eventual objective of making Bahasa Malaysia the main *medium of* instruction
Commencement of a Malaysia-orientated curriculum
Conception of a single system of evaluation for all

2)Rahman Talib Report and Education Act 1961 . Updating Period

Stress on 3R basic education . reading, writing and arithmetic
Stress on a strong spiritual education and the desired elements of discipline
Stress on a Malaysian curriculum
Upper secondary education of two streams, academic and vocational
Opportunity to continue education from 9 years to 11 years
Facilitation of education management procedures to improve the overall quality of education

3) Features of 1979 Cabinet Report

Stress on 3R basic education . reading, writing and arithmetic
Stress on a strong spiritual education and the desired elements of discipline
Stress on a Malaysian curriculum
Upper secondary education of two streams, academic and vocational
Opportunity to continue education from 9 years to 11 years
Facilitation of education management procedures to improve the overall quality of education

4) Education Bill 1995

The national education system is designed to produce world-class education from the aspect of quality to achieve the nation.s aspirations
The National Education Policy becomes the base for the national education policy
Duration of primary education is between 5 and 7 years
Pre-school education is part of the national education system
Technical and polytechnic education are upgraded
Allocations are made for the supervision of private education

b) National Education System

The National Education System at school level under the government education institution category consists of:-

(a) Pre-School Education

- Education programme for pupils of 4-6 years of age

(b) Primary Education

- The course of study at the primary level planned for a duration of six years but may be completed in five to seven years;
- It consists of national schools or national-type schools

(c) Secondary Education

Consists of lower secondary education and upper secondary education

- Secondary education that is available consists of:

1. academic schools
2. technical and vocational schools
3. religious national schools

(d) Post-Secondary Education

- Education that is provided for individuals who have completed lower and upper secondary education, but excludes higher education.

Schooling under the Government-aided Education Institution Category covers Fully Residential Schools under the authority of the Fully Residential Schools Unit, School Division.

Other education institutions established at the school level are:-

- Special Education Schools under the responsibility of the Special Education Department.
- Sports Schools under the responsibility of the Sports Division.

APPENDIX III

Software Evaluation Systems

(Adapted from Haugland & Wright 1997.p,23-24)

Systems	Number Of Programs	Age Range	Philosophical Approach	Most Important Factors
Haugland/Shade Developmental Scale	730	3-8	Piaget and Developmentally Appropriate Practices	-Age appropriateness -Child Control -Clear instructions -Expanding complexity -Independence -Process of orientation -Real-world model -Technical features -Trial and error -Transformations -Anti-bias deduction
High/Scope Guide	514	2.5-8	Children are active learners and should be in control of the computer environment	-Ease of use -Interactiveness -Deliver on promises -Effective use of computer's capacity
Children's software Revenue	866	3-12	Children are active learners	-Ease of use -Child proof -Ability to educate -Ability to entertain -Design features -Value
Computer services Department	1000+	K-12	All children can learn and should have access to computer technology	-Ease of learning -Ease of use -Congruence with curriculum -Ability to engage student interest -Ability to make use of computer capabilities.

Website for software evaluations

Websites	
BrainPlay.com http://www.brainplay.com	This catalogue contains software reviews from several different sources, including the Boston Computer Museum and older reviews from Children's Software Revue. A database of children's video reviews is also available on this site.
Children's Software Revue http://www.childrenssoftware.com	Contains a searchable database of 3400 software reviews, with the ability to add reviews, or publicly comment on a review. Content for the print publication and website is written by educators
EvaluTech http://www.evalutech.sreb.org	EvaluTech is a free, searchable database of curriculum-related print, *nonprint* and technology reviews specifically for Pre-K-12 educators based on the NCPDI print publication (North Carolina Department of

	Public Instruction, Educational Technology Programs Division).
Family PC http://www.familypc.com	The web site for the commercial print magazine, with information on latebreaking hardware and software. A good source of family tested reviews and interesting articles
Only the Best: The Annual Guide to the Highest Rated Software and Multimedia http://www.ascd.org/services/newotb/webpromo.html	This annual book and CD takes a survey of 20 or so review organizations, and lists just the top rated software
Superkids Educational Software Review http://www.superkids.com	This site contains software reviews with ratings (for home use), along with some interesting articles
Technology & Learning Magazine http://www.techlearning.com	Offers a searchable database of reviews from past issues of the magazine.
Worldvillage http://worldvillage.com	A nice source of illustrated reviews from 40 different *US-based reviewers.* Reviews cover games

Appendix VI

Observations schedule

	Estimated Date	Planning
A) Gathering the added data	**3 April – 31 May 2006**	
Preparation	3 April – 20 April 2006	-Prepared the plan for gathering the data -Contact the selected Preschool
Preschool A (Primary data)	August- Mid November 2005	-Completed
Preschool B (added data)	1 May -5 May 2006	
	1 May 2006 (9.00am-1.00pm)	-Induction -Meeting with teacher/children -Get general information about the classroom layout, activity and have some background about nursery , children and staff **1) Classroom layout** a. classroom size b. physical layout c. types of learning centres in the classroom **2) Information about the nursery** a. Number of children attending b. Age range of children c. Catchments of nursery (some information about family background) **3) Information about the nursery staff** a .Number of staff b. Training/qualification background c. Experience d. Time spent with the children and time on other task (e.g preparing material, cleaning up and extra **4) Class timetable**

	2 -5 May 2006 (one and half hour each day)	-Observation on preschool Social interaction during free play period at the computer centre (one and half hour each day) **-Focused only on the computer centre to have a closer look at:** **1) Arrangement for computer use in the classroom** a. resources b. location and arrangement c. equal access to the computers d. technical problems **2) To observe teacher's role and children's social interaction at the computer centre during free play period by using observation schedule checklist).** **In this stage I will identify:** a. teacher's estimated time spent the computer area b. teacher's active role/passive role c) Children estimated times spent in the computer area. (How many children and how long) and use Children's social interaction schedule checklist to observe their social interactions. Through the Children's social interaction schedule checklist the following items will be observed: a) child collaborates with peer at the computer b) child interacts with adult at the computer c) child demonstrates unfriendly attitude toward an adult in the computer area d) child monopolizes computer e) expressive language use at the computer centre checklist

		3) Semi structured interview a)Conduct the interview with the teachers b) Conduct the interview with the focused children. (These children were identified after I do the observation at the computer during free play period for 4 days). c) Conduct the interview with the non focused children. (Their name not include in the list of identified children-that means these children did not involved at all in the computer centre during free play period) **(All the interview with the children (focused and non focused children) will be done after I finish observed the children's Social Interactions at the computer centre)**
Preschool C (added data)	**8 May – 12 May 2006**	
	8 May 2006 (9.00am – 1.00 pm)	-Induction -Meeting with teacher/children -Get general information about the classroom layout, activity and have some background about nursery , children and staff **1)Classroom layout** a. classroom size b. physical layout c. types of learning centres in the classroom **2)Information about the nursery** a. Number of children attending b. Age range of children c. Catchments of nursery (some information about family background) **3)Information about the nursery staff** a .Number of staff b. Training/qualification

		background c. Experience d. Time spent with the children and time on other task (e.g preparing material, cleaning up and extra **4) Class timetable**
	9 Mei-12 May 2006 (one and half hour each day)	-Observation on preschool Social interaction during free play period at the computer centre (one and half hour each day) **-Focused only at the computer centre to have a closer look at:** **1) Arrangement for computer use in the classroom** a. resources b. location and arrangement c. equal access to the computers d. technical problems **2) To observe teacher's role and children's social interaction at the computer centre during free play period by using observation schedule checklist).** **In this stage I will identify:** a. teacher's estimated time spent the computer area b. teacher's active role/passive role c) Children estimated times spent in the computer area. (How many children and how long) and use Children's social interaction schedule checklist to observe their social interactions. Through Children's social interaction schedule checklist the following items will be observed: a) child collaborates with peer at the computer b) child interacts with adult at

		the computer c) child demonstrates unfriendly attitude toward an adult in the computer area d) child monopolizes computer e) expressive language use at the computer centre checklist **3) Semi structured interview** *a)Conduct the interview with* the teachers b) Conduct the interview with the focused children. (These children were identified after I do the observation at the computer during free play period for 4 days). c) Conduct the interview with the non focused children. (Their name not include in the list of identified children-that means these children did not involved at all in the computer centre during free play period) **(All the interview with the children (focused and non focused children) will be done after I finish observed the children's Social Interactions at the computer centre)**
Preschool D (added data)	**15 May -19 May 2006**	
	15 May 2006	-Induction -Meeting with teachers/with children -Get general information about the classroom layout, activity and have some background about nursery , children and staff.(e.g. preschool daily time table) -Induction -Meeting with teacher/children -Get general information about the classroom layout, activity and have some background about nursery , children and

		staff **1)Classroom layout** a. classroom size b. physical layout c. types of learning centres in the classroom **2) Information about the nursery** a. Number of children attending b. Age range of children c. Catchments of nursery (some information about family background) **3) Information about the nursery staff** a .Number of staff b. Training/qualification background c. Experience d. Time spent with the children and time on other task (e.g preparing material, cleaning up and extra **4) Class timetable**
	16 May –19 May 2006(one and half hour each day)	-Observation on preschool Social interaction during free play period at the computer centre (one and half hour each day) **-Focused only at the computer centre to have a closer look at:** **1) Arrangement for computer use in the classroom** a. resources b. location and arrangement c. equal access to the computers d. technical problems **2) To observe Teacher's role and children's social interaction at computer centre during free play period by using observation schedule checklist).**

		In this stage I will identify: a. teacher's estimated time spent the computer area b. teacher's active role/passive role c) Children estimated times spent in the computer area. (How many children and how long) and use Children's social interaction schedule checklist to observe their social interactions. Through Children's social interaction schedule checklist the following items will be observed: a) child collaborates with peer at the computer b) child interacts with adult at the computer c) child demonstrates unfriendly attitude toward an adult in the computer area d) child monopolizes computer e) expressive language use at the computer centre checklist **3) Semi structured interview** a)Conduct the interview with the teachers b) Conduct the interview with the focused children. (These children were identified after I do the observation at the computer during free play period for 4 days). c) Conduct the interview with the non focused children. (Their name not include in the list of identified children-that means these children did not involved at all in the computer centre during free play period) **(All the interview with the children (focused and non focused children) will be done after I finish observed the children's Social Interactions**

		at the computer centre)
	22 May -27 May 2006	-Revised all the data -Revisit the preschool (if needed) -organizes the data
	29 May -31 May 2006	-Interview with the Principal

Appendix VI

Observations schedule

	Estimated Date	Planning
A) Gathering the added data	3 April – 31 May 2006	
Preparation	3 April – 20 April 2006	-Prepared the plan for gathering the data -Contact the selected Preschool
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	2 -5 May 2006 (one and half hour each day)	-Observation on preschool Social interaction during free play period at the computer centre (one and half hour each day) **-Focused only on the computer centre to have a closer look at:** **1) Arrangement for computer use in the classroom** a. resources b. location and arrangement c. equal access to the computers d. technical problems **2) To observe teacher's role and children's social interaction at the computer centre during free play period by using observation schedule checklist).** **In this stage I will identify:** a. teacher's estimated time spent the computer area b. teacher's active role/passive role c) Children estimated times spent in the computer area. (How many children and how long) and use Children's social interaction schedule checklist to observe their social interactions. Through the Children's social interaction schedule checklist the following items will be observed: a) child collaborates with peer at the computer b) child interacts with adult at the computer c) child demonstrates unfriendly attitude toward an adult in the computer area d) child monopolizes computer e) expressive language use at the computer centre checklist

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Preschool C (added data)	8 May – 12 May 2006	
	8 May 2006 (9.00am – 1.00 pm)	-Induction -Meeting with teacher/children -Get general information about the classroom layout, activity and have some background about nursery , children and staff **1)Classroom layout** a. classroom size b. physical layout c. types of learning centres in the classroom **2)Information about the nursery** a. Number of children attending b. Age range of children c. Catchments of nursery (some information about family background) **3)Information about the nursery staff** a .Number of staff b. Training/qualification

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Preschool D (added data)	**15 May -19 May 2006**	
	15 May 2006	-Induction -Meeting with teachers/with children -Get general information about the classroom layout, activity and have some background about nursery , children and staff.(e.g. preschool daily time table) -Induction -Meeting with teacher/children -Get general information about the classroom layout, activity and have some background about nursery , children and

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		at the computer centre)
	22 May -27 May 2006	-Revised all the data -Revisit the preschool (if needed) -organizes the data
	29 May -31 May 2006	-Interview with the Principal

Appendix VIII

Children Social Behavior Checklist

Child code:..................

Gender: Boy/Girls Time: .... Date:.......

Child collaborates with peers at the computer

	1	2	3	4	5	6	7	8	9	10	Total
1. Speaks or signs to a peer at the computer.											
2. Asks questions or signs questions to peer about an activity.											
3. Takes turns at the computer.											
4. Shares ideas with peer											
5. Explains to another child how a device or program works											
6. Works cooperatively if two or more children are at the compute r											
7. Moves to improve his or her view of the monitor without interfering with others.											
Total											

Child interacts with adult at the computer

	1	2	3	4	5	6	7	8	9	10	Total
1.Can state at least one rule for using the computer when asked											
2. Explains a problem to an adult (e.g. "This doesn't work!")											
3. Follows rules or directions given by an adult. (This item requires that an adult give a direction to the child.)											
4. Communicates a process to an adult.											
5. Expresses enthusiasm verbally to an adult											
Total											

Child demonstrates unfriendly toward and adult in the computer area.

	1	2	3	4	5	6	7	8	9	10	Total
1.Expresses hostility											
2. Expresses hostility verbally to adult											
3. Ignores adult when adult attempts interaction.											
Total											

Child monopolizes computer

	1	2	3	4	5	6	7	8	9	10	Total
1. Monopolizes computer											
2. Child frowns, hits, or pushes to gain or maintain											
3. Pushes peer away.											
4. Manipulates, controls, directs others.											
Total											

Appendix X

UNIVERSITY *of* GLASGOW

Faculty of Education

Ethics Committee For Non Clinical Research Involving Human Subjects

EAP2 NOTIFICATION OF ETHICS APPLICATION FORM APPROVAL

Application No. ***(Research Office use only)***	E 400
Period of Approval ***(Research Office use only)***	08.08.05 to 31.08.06

Date: 08.08.2005

Dear Mahani

I am writing to advise you that your EAP1 application for ethical approval, reference E400 for 'An Observational Study of Preschool Children's Computing Activity' has been approved.

Please ensure that you retain this approval notification for future reference.

If you have any queries please do not hesitate to contact me in the Research Office and I will refer them to the Faculty's Ethics Committee.

Regards

Jackie Duff
Ethics Secretary

LETTER CONSENT FOR HEAD TEACHER

Dear sir,

I am a graduate student under the direction of Dr Maggie Pollock in the Faculty of Education at University of Glasgow . I am conducting a research study to understand children's peer social interaction at computer while working with a partner.

Each child will participate in two session; two 10 minute observation while working with partner on computer work session and a brief interview. The children will work in teams, of two during the two 10 minutes sessions (on different days) while I observe them. Afterward. I will talk to each child individually to obtain his/her perception on computer activities. The results of the research may be published , but the children's name will not be used.

If you have any questions concerning the research study, please call me at (0195447766). Thank you.

Sincerely

....

Mahani Razali

I give consent for my kindergarten to participate in the above study.

______________________________ Date:______________

INFORMED CONSENT FORM

Title of Project: Integration of computer technology into early childhood classroom.
Principal Investigator: Mahani Razali
½, 41 Annette Street
G42 8EH

This is to certify that, I ______________________________ , have been given the following information with respect to my child's participation as a volunteer in a program of investigation under the supervision of Mahani Razali. I understand that my child and I will receive no compensation for participating. I understand that my child participation in this research is voluntary, and that my child may with draw from this study at any time by notifying the person in charge.

1. Purpose of the study:
The study which your child will be participating is a part of research intended to investigate the effect of computer use on children social interaction. By conducting this study, I hope to improve the daily practices of computer technology usage in early childhood classrooms.

2. Procedures to be followed:
If you allow your child to participate in this research, he/she will be asked to continue his/her daily classroom activities. For the purpose of the study, the child will be observed and interviewed couple of times regarding to their computer usage. The observation and interviews will be conducted in his/her classroom without interfering his/her daily routine. All interviews will be audio taped. On one or two occasions , video recording will be made. Also photographs at times will be taken of equipment, product and children.

3. Discomfort and risks:

This study involves no risk to your child's physical or mental health. However, in participating in this research your child may experience some discomfort because of being observed and interviewed , but these feelings should not last long.

4. Benefits:

a. Benefits to me: with this study I will fulfill my dissertation requirement at Glasgow University.
b. Potential benefits to society: This study will investigate fairly new area of early childhood education , particularly in Malaysia. The result of this study will provide an example about how to integrate computer technology into the early childhood education. With publishing research result, I hope that early childhood education teachers and administrative receive benefits.

5. Statement of confidentiality:
All information collected for this study including audiotapes and interviews will be confidential and will be used for research and educational purpose only. The information will be kept in locked cabinets for further research purpose for 5 years and will then be destroyed.

	Yes	No
Permission to observation		
Permission to interview		
Permission to photograph		
Permission to video recording		

Your child's name:________________________________

Your name and signature:____________________________Date:

Teacher consent.

You and your student are invited to participated in the research project "The *effect of computer use on preschool social behaviour.* The procedure is completely "non-intrusive" and does not pose any known psychological or physical risks. Participating children will be asked to do the activities by using the computer. The session will be conducted a Sultan Idris Educational University Computer Laboratory and will be approximately one hour in duration. Breaks will be allowed during the experiment period to ensure that your child is not unduly fatigued.

POTENTIAL RISK AND/OR DISCOMFORT: There is no potential risk or harm associated with use of computer. The data obtained will be treated as confidential information and will be stored securely (access to computer files to be available by password only). No names or identifying information will be use in reports or publications. There are no cost or payments associated with this study.

BENEFITS: The ultimate goal of technology in the classroom is to foster children's learning. When discovering new technology, children need to experience enjoyment from their computer interactions in order to continue investigating the possibilities of that technology. Besides that, children enjoy working on computer that supports cooperative activities. Additionally, computer technology also can foster social interactions, such as increasing assistance between partners which have been shown to provide positive academic and social benefits .

WITHDRAWAL OF CONSENT: Participation is voluntary. If at any time, you decide not to participate, you may withdraw without any consequences to you or your student. If you withdraw from the study prior to completion, your data will be destroyed.

RIGHTS OF INQUIRY: If you have any questions about this research project, you can contact Dr Maggie Pollock on 0141-330-3352(m.pollock@mech.gla.ac.uk)or Pn Mahani Razali on 0195447766 (mahani@upsi.edu.my)

CONSENT: I have read this document and understand the information regarding the research. I have received a copy of this form. My signature indicates my voluntary consent to participate in this research.

....

Teacher Signature Date.

PARENT CONSENT FORM

I, ... of ....

....
....

Hereby give consent for my son/daughter/dependent

....

to participate in a study to be undertaken omit

by .... of ....

....

and I understand that the purpose of the study is in part fulfillment of the requirements for the degree of PhD in Faculty of Education, St. Andrew Building, University of Glasgow, Scotland only.

I acknowledge that :

1. the methods, and anticipated benefits, and possible hazards of the research study, have been explained to me

2. I voluntarily and freely give my consent to my child's/dependent/s participation in such research study

3. all data collected will be used for the research purposes only.

4. I am free to withdraw my consent at any time during the study, in which event my child's/dependent's participation in the research study will immediately cease and any information obtained will not be used.

Signature: .... Date: ....

Witness, if necessary:
Signature: .... Date: ....

SURAT KEBENARAN KEPADA GURU TADIKA

Tuan,

Saya , Mahani Razali adalah pelajar lepasan Ijazah di bawah selian Dr Maggie Pollock dari university Glasgow. Saya sedang menjalankan kajian untuk memahami bagaimana kanak-kanak berinteraksi sesama mereka semasa menggunakan komputer apabila menjalankan pelbagai aktiviti.

Setiap kanak-kanak akan terlibat dalam dua kaedah kajian iaitu iaitu pemerhatian dan juga kaedah temuramah. Setiap kanak-kanak akan menggunakan computer secara berpasangan selama 10 minit semasa permerhatian dibuat.. Pada akhir kajian, kanak-kanak ini akan ditemuramah untuk mendapatkan pandangan mereka berhubung dengan penggunaan komputer.

Hasil kajian akan diterbitkan, tetapi nama kanak-kanak yang terlibat akan dirahsiakan

Sekira nya pihak tuan ingin mengajukan sebarang persoalan, sila hubungi saya di talian (019-5447766)

Terimakasih.

Yang benar,

....

Mahani Razali

Saya memberi kebenaran kepada kanak –Kanak Tadika saya untuk terlibat dalam kajian ini.

__________________________ Tarikh:______________