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The developmentally appropriate use of computers with young children

Bonnie Potter
University of Northern Iowa

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Abstract

With millions of computers now in place in our society, we can safely assume that in one form or another they are here to stay. In fact, it is difficult to think of any sector of our society that is not adapting to this technology (Caissy, 1987). It is also safe to say that the idea of computers being used in education is not to be short lived. Research on the use of computers in elementary schools supports this assumption. According to reports from the 1985 National Survey: Institutional Uses of School Computers. (Becker, 1986) the proportion of U.S. elementary schools having five or more computers in the building jumped from 7% in 1983 to 54% in 1 985 (Buckleitner & Hohmann, 1987). During the 1984-85 school year alone, approximately 1 5 million students and 500,000 teachers used computers as part of their school's instructional program (Becker, 1986). In October, 1991, Sally Bowman, Director of the Computer Learning Foundation, stated that five years ago there was one computer to every 35 students in our classrooms. Today there is one computer for every 20 students (Bowman, 1 991).

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Charles R. May

July 30, 1993
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Director of Research Paper

Marvin Heller

aug 9, 1993
Date Approved

Graduate Faculty Advisor

Sharon E. Smaldino

August 9, 1993
Date Approved

Graduate Faculty Reader

Peggy Ishler

August 9, 1993
Date Approved

Head, Department of
Curriculum and Instruction

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CHAPTER I

INTRODUCTION

With millions of computers now in place in our society, we can safely assume that in one form or another they are here to stay. In fact, it is difficult to think of any sector of our society that is not adapting to this technology (Caissy, 1987). It is also safe to say that the idea of computers being used in education is not to be short lived. Research on the use of computers in elementary schools supports this assumption. According to reports from the 1985 National Survey: Institutional Uses of School Computers, (Becker, 1986) the proportion of U.S. elementary schools having five or more computers in the building jumped from 7% in 1983 to 54% in 1985 (Buckleitner & Hohmann, 1987). During the 1984-85 school year alone, approximately 15 million students and 500,000 teachers used computers as part of their school's instructional program (Becker, 1986). In October, 1991, Sally Bowman, Director of the Computer Learning Foundation, stated that five years ago there was one computer to every 35 students in our classrooms. Today there is one computer for every 20 students (Bowman, 1991).

This trend is not only reaching elementary and secondary grade

levels but has begun to show up in early childhood programs. In June of 1985, the Report on Preschool Programs stated that more than a third of preschools with 20 or more children were using a computer in the classroom. According to the Commission on Reading (1984), early childhood students begin to develop lifelong attitudes toward reading and learning in the home with parents playing a critical role in this process. Rickleman and Henk (1991) have stated that microcomputers are found in many homes today which has decreased their cost. The computer has begun to play an active role as a highly motivational teaching tool. Many children demonstrate an early interest in their families' computers. Some are attracted by the keyboard, others by the colorful screens, and still others by the animation. The outcome is that computers act as a natural source of curiosity for many young children.

In reality, computers have catapulted us into the information age. This change has altered the way we work and live. What does this mean for students? Clearly, they must be prepared to work in an information/computer-based society. Although computer technology that is currently being used by students will evolve many times before they are working adults, it is important that students are exposed to

the technology now and participate in its growth and change. They need to be comfortable with computers so that they will avoid the technology phobia experienced by many of the adult generation (Caissy, 1988).

Through the early 1980's the biggest concern of educators seemed to be how to obtain a computer for their class (Becker, 1984). As we begin the 1990's, more serious and technologically sophisticated professionals are putting their attention toward how they can improve their use of the classroom computer to enhance student learning. Educators can no longer accept and use questionable, untested software. Professionals must choose software and activities that are appropriate for sucessful learning. Bourk (1987) expressed this idea when he stated, "The real value of the computer lies not in its decreasing price and increasing capabilities,... but rather in its effectiveness as a learning device" (p6.).

Purpose of the Study

Three purposes of the study are given below. These include the following:

1. To review how current literature and research evaluates the effects of computer use on children's learning and the developmentally appropriateness of computer use with young children.

2. To provide a review of literature and research on computer uses and how they affect student learning in early childhood programs, taking into account the use of computers as a teaching/learning tool and selection of software.

3. To suggest ways that computers can be integrated into kindergarten curriculum by providing activities and ideas on computer integration into the total program, integration cross curriculum, and integration throughout units or themes of study. These suggestions will be based on the results of a review of literature concerning the use of computers in early childhood classrooms.

Need For The Study

With the increased numbers of computers in kindergarten classrooms, research has been done about the usage of computers with young children. Information found in this research has given educators a need to study the effects of computers on student learning. A study of this information is needed in order to know how to use computers appropriately with early childhood students.

Limitations

While effort was given to the use of original research sources, some secondary sources were used as a result of limitations of access to available research. The study was limited to a review of literature which was published in the last 25 years.

Definition of Terms

The following terms are defined as used in this study in order to aide in clarification and understanding:

Accomodation-- when a person meets new situations that do not fit into their existing schemata they must either modify the schemata or create new ones to fit the new stimuli (Penrose,1979).

Assimulation-- when a person forces or is forced to fit new stimuli into their existing schemata (Penrose, 1979).

Child Control-- children are active participants, initiating and deciding the sequence of events rather than reactors, responding to predetermined activities (Haugland & Shade,1988).

Microworld-- a child oriented computer experience, where children are in control, acting on software to make events happen rather than

reacting to predetermined questions and closed-ended problems (Haugland&Shade,1988).

Linear Conditions-- a step-by-step method of problem solving that is too predictable and does not allow for creative interactive thought Kreuger, Karger,&Barwick (1989).

Animated Workbook -- the comparison of software programs to a worksheet that sometimes act like cartoon characters.

Simulation -- is something that represents an object or action in real life through a model (Davidson, 1989).

Developmentally Appropriate Curriculum -- a curriculum for young children that is planned to be appropriate for the age span of the children within the group and is implemented with attention to the different needs, interests, and developmental levels of those individual children (Bredekamp,1986).

Learning Development Theory -- Piaget's theory has been called different names in other writings, in this study it will be referred to as his learning development theory.

CHAPTER II

REVIEW OF LITERATURE

Evaluation of Effects and Developmentally Appropriate Use of Computers With Young Children

Research Studies on Effects of Computer Use With Young Children

The role that computers are playing in our society is increasing in different areas, such as industry, medicine, business, homes, and in early childhood education (Hougland, Shade, 1988); therefore, it is very important that educators carefully evaluate what the appropriate role is for computers in the early childhood curriculum.

The computer can be used as an educational tool in early childhood classroom. When it is used for educational purposes, the same as blocks, paints, paint easels, magnets, magnifying glasses, attribute blocks, books, pencils, scissors, the computer provides the child with unique ways to learn. Educators realize that the unique ways of learning that these tools offer must be carefully selected and facilitated so they can provide appropriate experiences for young children. This kind of teaching will reflect a sound developmental approach to learning (Hougland and Shade, 1988).

Much research has been done concerning the use of computers with early childhood children, but much more is needed to help educators realize the appropriate way computers can be used in the early childhood curriculum. Presently, researchers do not agree on the influence of the computer's impact on learning. Much division has occurred on the issue of how the computer affects the learning of children. There is concern about the long term consequences which may affect the child's learning (Pardeck, Murphy 1989). Kruger, Karger and Barwich (1989) contended that it is hard to discern any clear evidence of the computer's influence on learning because data on children's use of the computer is not easily analyzed. Most adults today did not encounter computers as children; and consequently, they find it difficult to make parallel assumptions about children today and the role of computers. As a result, research is done only through observation of what we see happening in interactions between children and computers. In some researchers' view, this gives us only glimpses of the phenomenon. Kruger, et al. (1989) have written that as we increase the presence of computers in the early childhood curriculum, educators must weigh their cognitive and social influence on young children now and in the future. Murphy and Pardeck (1989) researched the linear conditions, or

the use of computers where choice and discovery and child control are not provided, and they contend that this type of computer learning contributes to the negative academic development on the part of students. Furthermore, this learning style may stifle the cognitve and social aspects of children's development. Murphy and Pardeck (1989) go on to say that without understanding the long-term effects of linear computerized learning it is hard to anticipate or correct any negative effects that computers may have on children. They caution educators of young children not to jump onto the computer bandwagon without looking at the research. In addition, after looking at the possible effects computers may have on children, Murpy and Pardeck have stated that decisions about how to design early childhood curriculum using computers should be undertaken and carried out.

Fears about the use of computers with young children have been expressed in the past by Abt (1980). His conclusion was that the computer and television age had the potential to lead children to social isolation and withdrawal. Also, Heller and Martin (1982) wrote that children may possibly choose to interact with machines rather than people. In addition to these negative concerns, Barnes and Hill (1983)

stated that children are likely to experience problems in social behavior if computers limit their social interaction.

Many researchers and educators including Davidson (1989), Murphy, Pardeck (1989), Clements (1985), Campbell (1988) and Burkleitner (1987) have written that even with these fears, computers should be used by young children. But as Kruger, Karger and Barwick (1989) have suggested, we must keep in mind as we plan computer use for children about how we can avoid its negative influences. Computers should not be allowed to alter children's perceptions of time and space.

Much research has been done since 1980 on the effects of computers' influence on the social development of young children. Rhee and Bhaunagri (1991) and Wright and Samaras (1986) have described positive social interaction of young children while working with peers on the computer. Davidson (1989) has stated that while using computers children tend to form groups to support one another in their computer use. Rhee and Bhaunagri (1991) indicated that four year olds were more involved with self-initiated peer interactions with computers than they were with teacher initiated interactions with children; however, it was noted that pre-instructions were appropriately given by teachers prior to this observation.

A study which parallels Rhee and Bhaunagri (1991) was done by Muller and Perlmutter (1985) in which they observed that computers were encouraging students to do problem solving through natural group interaction. Paris and Morris' (1985) research showed that children in peer teaching situations shared their discoveries when they cooperatively used the computer.

Child Development Research/Developmentally Appropriate Use of Computers With Young Children

The importance of looking at computers and the effects of their use on the social and cognitive development of children can be seen more clearly by first taking a brief look at the social development theory of the Soviet psychologist Lev Vygotsky (1978). He stated that the manipulation of learning tools by children, such as puzzles, books, and words as objects become children's reference points for social interaction. Also, he explained that through the social setting (social interaction) a child's speech memory develops and then from that experience concept formation begins. Children should have a chance to use the computer as a learning tool in a socially interactive way to help them develop at a higher level their speech memory and concept formation. Vygotsky's theory supports this view of learning.

Many other positive aspects of computer use by young children are revealed in the research. One of these is the value of the discovery approach while using the computer. Piaget (1970), wrote that children are builders of their own intellectual structures or knowledge. His theory describes how children actively explore their world. This exploration is done through the processes of assimilation and accomodation as the children acquire and construct knowledge. In the following statement, Piaget distinguishes between active discovery and passive learning and ready made truths.

> If we desire to form individuals capable of inventive thought and of helping the society of tomorrow to achieve progress, then it is clear that an education which is an active discovery of reality is superior to one that consists merely in providing the young with ready made truths to know with. (p. 259)

One aspect of Piaget's learning development theory deals with another form of knowledge, logico-mathematical knowledge. This knowledge is not limited to mathematical knowledge, but rather, children develop logico-mathematical knowledge by constructing past experiences, knowledge, and concepts into meaningful relationships. For example, a child builds a concept of gravity by dropping many objects and seeing

the results. By doing this activity, the child concludes that objects fall when dropped. Hopkins (1992) has observed that teachers can help their students build knowledge using Woolly Bounce software and real life experiences. In one Woolly Bounce lesson, primary teachers developed activities in which children in a group situation were given a chance to discover facts about real life materials, by bouncing balls. In a hands on activity students bounced different sizes and shapes of balls to decide which bounced higher. In doing this activity, students were given a chance to construct logico-mathematical experiences and relationships. Later they used the computer software Woolly Bounce which was a simulation of the same drop and bounce activity they had completed. Because of their experiences with bouncing balls, students related more to the computer simulation activity and further developed their knowledge about bouncing objects. The computer assisted the students by slowing down the motion of the bounces so the students could easily count each bounce and clearly observe the rebound height.

The importance of real life experiences that are integrated with computer experiences is being recognized, as we look at Piaget's theory of learning development and the stages of development that children go through. In the Pre-Operational stage young children are said to need

real life experiences along with the more abstract experiences such as a computer simulation.

Dauite (1988) gave a similar example of children's developing minds based on Piaget's Stages of Development, and she further discussed how it relates to writing on the computer for young children. She gave the example that a five year old's view of a water mill is different from an eight year old's view because of the structures that have been created there. The five year old may see the mill as a wheel with water pouring off it. They are capable of focusing on one highly visible variable or step in the process. The eight year old might, depending on their past experiences, perceive the water mill as a set of interlocking gears and wheels propelled by a current in the stream, because they are able to coordinate multiple variables. Dauite (1988) suggested that this example can be used to see how children at five years old view the use of a computer to write differently from an eight year old. Because of new theories about children's writing (Caulkins, 1986; Graves, 1983), it is understood that even though a five year old child can write stories before they can spell by using their own symbols, that writing assignments for young children should be given in a way that emphasizes the activity as a discovery process. At eight

years of age children know symbols and can use them in a structural way. This is because they have had the chance to experience writing in many ways with the use of several tools. The young child must assimulate and accomodate alphabet sounds as well as learn how to use tools to write. Dauite stated that some young children can use the computer as a tool. She further stated that by taking into account Piaget's discovery process, children learn to use the letters and sounds on a computer, sometimes even before they can write them. Children do this by assimulating and accomodating new knowledge and relationships about letters and sounds in a discovery approach. With the advent of new children's graphics programs such as Color Me and Kid Pix and writing programs such as Magic Slate and KidworksII the process is made simple enough to allow the child to do this discovery in a method which is developmentally appropriate.

Seymore Papert's (1980) view of developmental learning in regards to the computer is discussed in his book Mindstorms. In it Papert defines microworlds as task domains or problem spaces. He observed that microworlds are structured to allow a young learner to exercise particularly powerful ideas or intellectual skills. These microworlds represent a child-oriented computer experience. With these

experiences children are in control acting on software to make events happen. Child control is emphasized instead of having them react to pre-determined problems and closed ended questions. He has invented software such as Logo which teaches children through problem solving. Through this problem solving process, children become motivated and begin to grow in creativity, reflectivity, and metacognition. In 1983, Pea did a study using Logo to see if that happened. He contended that young children in his study did not gain in the areas mentioned above. Papert in 1986 refuted Pea's findings and stated that the postest did not accurately test whether the children's cognitive skills had increased; instead, according to Papert, Pea's findings tested the wrong attributes. In 1984, Clements and Gullo did a study with six year olds using Logo, and their study showed an increase in areas of fluency, originality, devergent thinking, reflectiveness, and metacognition.

Today the emphasis on problem-solving skills has become more common, and not just in the use of computers. But software companies have begun to realize that programs with this emphasis are in demand for all children. This open-ended value of software has begun to be emphasized because of the studies about the discovery process and hands on nature of learning by children. Consequently, less emphasis is

being placed on linear types of software, such as drill and practice types of software.

If educators continue to use the computer with young children, they must continue to study its effects on children's learning. New studies will help educators evolve and change their use of the computer, and the research findings will help guide them to more appropriate use of computers with young children.

The computer, however, may have negative effects on students' cognitive and social development. Social interaction is important while using the computer. Vygotsky's theory points out that the manipulation of objects in a social setting helps build children's speech memory. This in turn helps them with concept development. When children consistently use computers in isolated situations, their concept development may be hindered.

Piaget's theory of learning development gives an idea of the importance of using the computer in a discovery approach with young children as well as providing hands on real examples for the child to build concepts and relationships.

Finally, the debate about Logo points out the value of using computer software that stimulates higher order thinking processes in

children, for it gives them more of a sense of control over their learning. Thus, the concern that educators must consider is not whether the computer is a developmentally appropriate tool for young children, but how can it be made developmentally appropriate.

Computer Uses and How They Effect Student learning In Early Childhood Programs

Uses of Computers as a Teaching/Learning Tool

Computers have taken their place beside the finger paints, playdough, books, blocks, and other educational tools found in the early childhood program. As a result, it is time for educators to take a look at how computers can be used appropriately with young children.

Before early childhood educators can decide how to use the computer, they must be aware of the various ways in which computers can be used (Davidson, 1989). Because computers have many diverse uses, it is confusing and overwhelming for educators using computers with students in deciding which uses are appropriate for young children. It helps then to categorize its uses (Caissy, 1988). Davidson (1989) in her book about using computers in early childhood classrooms, has classified the uses of computers with the following categories: tutor,

tool, tutee and thought provoker. Clements (1985) presented the uses of computers for young children as six metaphors. These metaphors include the following: tutor, subject, tool, pencil, sand castle, and building block. A closer look at these roles will help to pinpoint how computers can be used appropriately in early childhood classrooms.

Categories

When using it as a tutor with students, the computer presents information to the user. How it tutors depends on the software that is being used. Sometimes software is in the form of educational games; sometimes they are in the form of drill and practice or they may be in the form of simulations. An example of an educational game that might be used is one that asks children to practice using directions by finding their way through a maze. A child may be more motivated to spend time with a computer educational game than with a game presented in another format (Spencer and Baskin, 1984).

Drill and practice programs ask the child a question and the child must respond in a more playful form. For example Mackids asks children to do such things as find the matching letter on the keyboard and to match it to an animated object for the correct beginning sound. Because of the animation and the ability of the computer to say the

word it makes, it seems less like drill. (Davidson,1989) Many early childhood software programs are of this type. These programs, sometimes referred to as animated workbooks, usually teach age appropriate information, such as letters, numbers, opposites, sequence, and shapes.

Simulations are programs in which a child takes a role in the model situation set up by the computer. For example, a realistic simulation might involve the child choosing family groceries from different food groups displayed on the screen. Simulations are intended to help students learn things in the classroom that usually would be difficult to provide actual experience from the classroom. (Spencer and Baskin, 1984)

Davidson (1989) has stated that these tutor types of software are good uses of the computer with young children if the drill and practice or simulations are not the only or main kind of software available to students. In the National Association for the Education of Young Children's Statement on Developmentally Appropriate Practice, (1986) Bredekamp stated that "Children learn best when the information is meaningful to a child and in the context of the child's experience and development". (p. 49) If computers are used excessively for drill and

practice with young children it could result in a stereotypical way of learning.

When students use the computer as a tool, they are using it as a means to reach an end. The computer is actually many tools in one. As a tool, the computer could be used in helping a child to write, to create, to calculate, to draw, and to do many other things. The recent introductions of this kind of software have become more age appropriate for young children. There are word processing programs such as Kidworks II (Davidson and Assoc. 1992) that give a young child a chance to explore writing and language expressions even before they are able to write with a pencil comfortably. There are graphics programs such as KidPix (Broderbund) that allows students to draw and write without requiring knowledge or use of the keyboard. Along with software, other computer equipment such as touch screens and children's keyboards make the computer more friendly for young users. This allows them a wider expansion of uses to discover and to create. The new voice capability of computers and the addition of the mouse allow young students more flexibility in writing and hearing words, sounds, directions, and stories. A child is able to make greater choices and to control the computer more with these new additions. Kurland

(1983) and Davidson (1989) stated that the potential for the use of the computer as a tool for young children is great and will only be limited to the educator by the availability of equipment and software. Also these authors place much value on the ability of educators to facilitate and to provide appropriate computer programs for students.

In the tutee mode of computer use the child acts as the tutor instructing the computer, which acts as the tutee. In order for children to talk to the computer they must learn how to talk to the computer in a language that it understands. The child then is programming the computer. Seymore Papert (1980) has described his Logo program as a problem solving program. In order for children to use this program they must learn a language to talk to the computer. The child is in control of what the computer does. For instance, the child can instruct the computer to make a square by using a set of commands. It is uncertain whether or not this program is developmentally appropriate for young children (Clements & Gullo 1984; Pea, 1983). One main problem that was stated by Davidson (1989) and Spencer and Baskin (1984) is that it takes much instructional time to teach the Logo language to students. The appropriateness of this at this level is uncertain; however, the interest in the problem solving type of open

endedness of this software has encouraged others to create thought provoking software.

When children use the computer as a thought provoker they are able to use it in an open-ended way in which they have been given control over it to do what they want or need to do. A self-discovery, self-authored, problem solving program such as Mackids Dot to Dot would be an example of this type of software. Other programs have children find a hidden treasure or create a story by choosing pictures. Database programs are developed in which students create lists or record information and then they use the information to interpret solutions. Davidson (1989), Caissy (1988) and Spencer and Baskin (1984) agreed that this type of use of the computer is appropriate for young children because it allows the child to manipulate, explore, and experiment while they are in the process of learning new concepts.

Selection of Software

In a developmentally appropriate early childhood classroom children spend much time working in small groups (Bredekamp 1986). These classrooms are filled with learning centers which allow children to work on open-ended activities that have been developed for curriculum

integration and skill development. The teacher, as facilitator, guides the students but allows enough room for the child to become self-directed. If the computer is to be an accepted part of the early childhood classroom, it must allow for this same type of teacher guided, child-directed, open-ended use. If the classroom environment and teacher encourages experimentation, exploration, social interaction, conversation, and creativity, then the computer can offer these things too. The computer is an educational tool whose value is dependent on the way people use it (Davidson, 1989). When early childhood educators use computers in the ways spoken they must be careful to choose software that reflects developmentally appropriate values also. Haugland and Shade (1988) have developed ten criteria that early childhood educators can use to determine a software program's possibilities for being developmentally appropriate. It is important to add that even if a software does meet these criteria it may not be used appropriately. The educator is therefore responsible for its appropriate use.

Haugland and Shade suggested the following ten criteria for software selection:

1. Age appropriateness. The concepts reflect realistic expectations for the children.

2. Child control. Children are active participants not reactors.

3. Clear instructions. Spoken directions are needed for nonreaders.

4. Expanding complexity. Entry level is low , and children can easily maniupulate the software. Software expands in difficulty as children explore.

5. Independent exploration. Children are able to manipulate the software without adult supervision.

6. Process orientation. Children learn through the discovery process rather than being drilled for specific skills.

7. Real world presentation. Software represents real objects in the child's world.

8. Technical features. Quality of sound and color are realistic and motivate students.

9. Trial and error. Children are able to test alternative responses.

10. Visible transformation. It allows children to view processes and effects that are more difficult to observe in daily living (39).

Computer programs are becoming increasingly better as educators become more familiar with the needs of the young child. At the present time, it is fairly easy to find software that fits curriculum

needs. The High/Scope Educational Research Foundation in Ypsilanti, Michigan has published the High/Scope Survey of Early Childhood Software which categorizes software for early childhood curriculum by subject. This source also gives software an evaluation score according to its age appropriateness and value. Awards are given to outstanding children's software and a review is written on each software program by early childhood educators.

Suggested Methods To Integrate Computers Into Early Childhood Programs

Integration of Computers Into The Total Learning Program

Early childhood teachers who choose to use computers in their classroom ultimately make the decisions as to how they will integrate them into their curriculum. The Computer Literacy Task Force of Pennsylvania's Department of Education (1987) stated that before teachers can be expected to integrate computers into their curriculum they must possess the knowledge of developmental needs of their children. They must know computer usage that includes hands-on experiences with computers. Finally, they need to acquire knowledge of the way to evaluate software. Each teacher will find their situation

different so as a teacher begins to plan for using computers in the classroom it will be good to develop a plan (Caissy, 1988). Educators' plans will help them decide the best way to integrate computers in their situation for their students. Caissy suggested that while creating this plan educators need to ask questions such as the following:

1. Does their district have guidelines and existing policies for computer use at this level?

2. How much computer exposure have students experienced?

3. What curriculum objectives across the curriculum will be served by the use of computers?

4. What computer and software will be available and how often?

5. How will computer literacy be evaluated?

6. How will parents and administrators be informed of computer use in the classroom?(p.24)

After a teacher is able to plan according to their students needs and curriculum, the task of fitting the computer into the classroom environment becomes the focus. Davidson (1989) and Caissy (1988) agree that there is no ideal spot for the computer. The location should allow enough room for more than one chair and depending upon the

group, many chairs, so children will be encouraged to develop speech and language in their conversations at the computer. It is important to locate the computer where the teacher is able to assist with as few disruptions to the class as possible.

Computer instruction requires planning for arrangement of space and organization so computers can be used in small or large groups and by individuals. In planning the early childhood room, the creation of learning centers in the classrooms provide flexibility to the use of the computer. This flexibility can then make it easier to place the computer in various centers (math, writing,and science) depending upon what is happening in the curriculum at specific times. Having the computer on a moveable cart helps to provide the flexibility for the teacher to move the computer to the area needed and available for large and small group instruction.

Caissey (1988), Davidson (1989), Bowman (1991), and Ductorow (1991) offer many ideas on how to include computer skill instructions into the curriculum. One idea suggested was using rebus style charts reminding children of appropriate behavior and procedures to follow while using the computer (Davidson, 1989). These charts, rules, and procedures should be taught by the teacher early in the year

so students are aware of them as they begin learning to use the computer. How teachers decide to introduce the computer depends on their class and personal teaching style. Some of the research suggested using large group in a mini lesson style of instruction while others suggested rotating small groups or individuals for explanation and introductions.

Children with the computer should be allowed time for playful interaction and exploration in order to get acquainted with it. Also, they should become familiar with new software, and new procedures, or steps in computer literacy (Bowman 1991, Davidson 1989, Doctoraw 1991).

As children use the computer and various software, they become more able to self-direct their learning on the computer. Some students do need time and more individual help than others, so it is suggested by Davidson, (1989) that teachers introduce software gradually. This is necessary in order to give students time to develop skills independently. The gradual introduction of more involved computer literacy skills can take place as the teacher sees the need in the curriculum. The teaching of these computer skills (Davidson, 1989) can take place within the curriculum, and it does not necessitate special computer literacy time for

young children. If students are allowed time to explore and manipulate keyboards such as the Muppet Learning Keys they gradually are able to assimilate computer skills into their concept development at the level they need it. It is recommended by Nuefeld (1989) that teachers provide associates or parent volunteers to assist students with difficulties when it is possible; however, both Olson and Johnston (1989) and Nuefeld (1989) expressed the fact that although young children do encounter problems when writing with word processing programs at this age level, these problems provide problem solving avenues for students. By using the computer to solve these problems, the students are motivated to learn the learn the alphabet and writing skills. Teachers should choose child oriented word processing programs that simplify potential problems, and that also allow teachers to customize word processing programs to fit the needs of different students.

Integration of Computers into the Curriculum

Computers can be successfully integrated into the early childhood curriculum; however, some curriculum areas are easier to integrate than others. This is because of the availability of appropriate software. The

integration of computers in the areas of math and language arts will be discussed in the following sections.

Math

Studies have explored the potential of computer graphics for developing spatial and geometric abilities. Working with preschoolers, Forman (1986 b) found that certain graphics programs offer a new dynamic way of drawing and exploring geometic shapes. These programs which were similar to KidPix and KidworksII allow a child to draw rectangles by stretching electronic rubber bands. Using this process gives children a different perspective on geometric figures. The areas filled with colors prompt children to think about the topological features of shapes. These features include closure, which is the consequence of their actions rather than static shapes (Clements, 1987). Campbell (1988) has stated that manipulative materials play a crucial role in the learning of mathematics for young children. This is necessary for students to verbalize their perceptions concerning hands-on mathematical materials. Also, teachers need to help students make the connection between materials and software. Technology can stimulate the connection in shape recognition, patterning, and counting

classification, but technology should not replace active instruction and exploration with physical objects.

A shapes acitivity such as Build a Mouse House in Millie's Math House software program should begin with shapes, blocks, paper shapes, and objects in the environment. Similar activities would occur before using a counting program. Counting of real objects and set building tend to occur before the use of software programs (Buckleitner, & Hohman, 1987).

Computers stimulate social interactions of preschoolers in problem solving activities (Muller & Perlmutter, 1985). Studies have indicated that programming in Logo increases problem solving abilities in kindergarten (Degelman, Free, Scarloto, Blackburn and Golden, 1986). Clements (1987) has stated that this problem-solving aspect of computer programs has great potential; however, in the case of Logo, much scaffolding or interaction with a teacher is needed to help children to learn the appropriate information. Whether it is appropriate or not to do the scaffolding, is questionable. Problem solving programs are being developed. These include Build a Bug and Cookie Factory in the Millie's Math House program which allows students of this age to experiment, exercise control, solve problems, and learn through their own

initiative in a fun, motivating way (Eiser, 1993). Graphics programs such as Kidpix can provide these same type of experiences for younger students while working on patterning, shapes recognition, and number recognition, and joining and separating sets (Eiser, 1991).

Language Arts

Increases in social interaction and positive attitudes help generate increased language use. Preschoolers language activity measured by means of words spoken per minute was almost twice as high at the computer as at any of the other activities such as playdough, blocks, art or games (Muhlstein and Croft, 1986).

According to Davidson, (1989) children learn language by using language. Software like Explore-a-story where children can pick up objects on a screen and move them around to create stories about them encourages children to use their language to create stories. This series could easily be extended to hands on activities by adding dramatic play as a follow-up or pre-computer activity.

When children use graphics programs such as Kidworks II they create fantasy situations and use language to express that fantasy. Wright and Samaras, 1986, observed two young children giving the lines they were constructing on the computer human qualities. When the lines

went off the screen they declared, "It's sleeping" and when it reappeared they said , "It woke up". In another instance a young boy pretended the eraser cursor was a termite eating wood.

One reason why writing is difficult for young children is because of its tedium. Spoken language provides them with power over their environment. Written language is weak in comparison (Clements, 1987). But certain computer programs can infuse writing with control and power. Children can experiment with letters and words without being distracted by the fine motor aspects of handwriting. Programs like KidworksII and KidPix help children to create words and pictures and will also say letters to the children as they choose them (Eiser, 1991).

Word processing programs also elicit language and writing. Some children narrate a story as they type random strings of letters. Others may have a clearer notion of the connection between the letters used and words read back. These children might type out their stories or labels using invented spelling. Teachers can type stories which are dictated by students and these can be printed and compiled in class books, which can be reread. This is in contrast to those written by children with invented spelling. Teachers can compile lists, write thank you notes, and other messages with the whole class. These writing

activites give children purpose and reasons for writing (Davidson, 1989). Nuefeld (1989) has suggested that educators can minimize some potential problems that young children may have with word processors by simplifying these programs with customizing options and by using child focused word processing programs. Children at this age should be expected to use only the most basic editing options.

The list of language arts software is extensive, but again, consideration about the availability of software, age appropriateness, and computer accessory availability is necessary to make choices for planning ahead. A newer program which involves computer and the CD Rom, the Discus Library, is a set of interactive books for children. Actual pages of the Discus books appear on the screen with text and illustrations. Books such as Beatrix Potter's Peter Rabbit come to life as the user turns the pages with the use of the mouse. This program has sound capabilities. Using Discus books, children learn about comprehension, pronunciation, and vocabulary. The use of the mouse and sound gives young children and nonreaders a chance to read these books very easily. These books allow students of different levels and with different needs to practice reading and listening skills. Words can be highlighted and read by the computer as well as defined.

Young children can point to objects and have the computer show the word that names the object while the computer pronounces it, thus helping the children to understand the speech- print connection. Teachers can provide many shared reading experiences with students as well as increase the stories and vocabulary. This is done by organizing information into units of study and by creating center activities for the hands on experiences, so vital to children of this age.

Integration of Computer Use in Units of Study

In many early childhood classes teachers organize activities and skills around a theme or unit of study. The theme becomes the vehicle for providing opportunities to encourage development in all curriculum areas. Computers and related activities can be used to support the teaching of units. Davidson (1989) has suggested three ways which computers can support a unit. The first way is when the teacher includes software programs that provide unit-related information. The program What Makes A Dinosaur Sore?, which is part of the Explore-a Story Series, is an open-ended software that can enhance a dinosaur unit by providing students choices of pictures to create a story about dinosaurs. Drill and practice software such as Dinosaurs can be used to classify dinosaurs. Davidson's (1989) second way to integrate

computers into a unit would be to use programs such as KidPix and Kidworksll, which are tool programs. These programs would allow a child to use related knowledge about dinosaurs in a dinosaur unit to write and draw about them, thus increasing the use of the language being learned.

Finally, Davidson (1989) has recommended that children can learn to use tool programs or keyboarding by doing activities related to the unit. Stories can be dictated to the teacher by the students. The students can help spell new words and find letters on the keyboard. Graphs can be made, or databases can be created to help record information on units or related math/science skills.

Computer programs for young children are becoming increasingly better as educators become more familiar with the computer needs of young children. With good planning, educators will be able to find software that integrates with the development of a theme or unit.

CHAPTER III

SUMMARY AND CONCLUSIONS

Summary

The purpose of this review of literature was to determine the effects of computer use on young children's learning and to evaluate the developmentally appropriateness of its use. This review also looked at how to appropriately implement computers in early childhood programs. To accomplish this purpose, three statements were addressed in this study.

Chapter II begins with a review of literature that evaluates the effects of computer use on children's learning. Presently, much division has occurred on this issue. Results of research cited suggested that if children are allowed to use the computer in a socially isolating manner, it could hinder their social development. Other results of studies on peer interaction while students were using the computer in small group settings, have indicated positive affects on social and cognitive development of young children. Further research stated that children's creative interactive thought processes could be negatively affected by linear conditions of some computer software programs. However, in

other studies, improvement of higher order thinking and problem solving skills was observed during peer interactions of early childhood children while using the computer.

The purpose of evaluating the developmentally appropriate use of computers was accomplished in this study by reviewing literature and research on child development as it applied to the use of computers with young children. It was stated in this review of literature that the purpose was not to consider whether or not the computer is a developmentally appropriate tool but rather how educators can use the computer to provide developmentally appropriate learning for the young child.

According to this review, social interaction is developmentally appropriate while using the computer with young children. The manipulation of objects in a social setting helps children to build speech memory. This in turn helps them to construct concept development.

It was also implied that according to the learning development thoery young children should be encouraged to use the computer in a discovery approach. Further research implied the importance of using

hands on related computer activites with these students. These asumptions were made, in this review of literature, while considering the development stage of early childhood students.

This research on the developmentally appropriate use of computers with young children also supports the idea that open-ended computer software that stimulates higher order thinking skills should be used with early childhood students. While using these kinds of computer programs, children are given a sense of control over their learning and are encouraged to use creative interactive thinking which is developmentally appropriate.

Computer uses and how they affect student learning are catergorized by research stated in this review. There are diverse ways to use the computer as a teaching/learning tool. This diversity makes it difficult for educators to decide which uses are developmentally appropriate. Categorizing, as was done in this study, helped teachers to classify computer uses and pinpointed how to choose them appropriately for the early childhood classroom. In these categories computers play the role of tool, tutee, tutor, and thought provoker. Related literature, in this study, stated that the roles of tool, tutee, and thought provoker were more developmentally appropriate for young

children. The role of tutor when using simulation programs was also considered appropriate.

The review of literature discusses that when computers are used as an educational tool their value is dependent on how people use them. When early childhood teachers use computers in a teacher-guided, open-ended manner, they need to carefully choose software that reflects this developmental approach. Ten criteria were explained in this study that help with the process of software selection. These criteria are as follows: age appropriateness, child control, clear instructions, expanding complexity, independent exploration, process orientation, real world presentation, technical features, trial and error, and visible tansformation.

Integration of the computer into the total kindergarten program, into the curriculum, and into units of study was the last purpose discussed in this review of literature. When integrating computers into the total program, related literature suggested that educators develop a plan to decide ways to integrate computers. Six questions were included to help teachers decide how to plan according to student needs, environment, and curriculum. Specific ideas were shared about the location of the computer, the flexibility of it's use with large and small

groups, inclusion of computer skill instructions, time alotment for different students, and the use of parent volunteers.

It was stated in this literature review that computers can be sucessfully integrated into early childhood curriculum. Some areas are easier to integrate because of the availablity of software. Math and language arts computer integration, were highlighted in this review of literature. Suggested ways to integrate computers in math instruction involved shape recognition, patterning, counting, and classificaton through the use of software. It was stated that active math instruction and exploration of objects are vital and should not be replaced by technology.

This review of literature on the integration of computers in language arts implied that word processing programs can elicit language and writing responses from young children. Using child-focused word processing software, educators can minimize potential problems that young students could encounter while writing on the computer. It was also suggested that children's use of programs, such as the Discus Books, can help students discover reading and provide allowance for different levels of ability. Additional ideas for specific software and activities that could be integrated in an early childhood language arts

program such as shared reading experiences, creation of word databases, and story dictations were cited.

Information from the National Association for the Education of Young Children's guidelines included in this study suggested that early childhood educators organize activities and skill development around themes or units of study. It was further stated in related literature, that computers can be used to support the teaching of units. This can be accomplished by the use of unit supporting software and computer tool programs that encourage children to write and draw about unit concepts. When planning integrated units, research stated that educators need to make an effort to include computers and related activities in conjunction with other traditional experiences.

Conclusion

The following are conclusions that have been drawn from this review of literature. These conclusions are as follows:

1. Computers are capable of extending children's thoughts, promoting social development, and encouraging meaningful language.

2. Inappropriate uses of computers with young children have little or no benefit but hold potential problems. These problems include;

the hinderance of social development of students, and the disruption of young children's creative interactive thoughts.

3. Our goal as early childhood educators, when it comes to computers, should be "to develop problem solvers not programers, communicators not word processors, and motivated happy children not distressed early acheivers" (Clements, 1987).

4. Computers are an important component in the early childhood classroom.

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APPENDIX

SOFTWARE/SOFTWARE GUIDES

Software

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