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AUTHOR	Escobedo, Theresa H.; Evans, Sharon
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ABSTRACT

This study explored children's preferences for 13 computer software programs and field-tested the relationship of developmentally appropriate practice (DAP) ratings of early childhood computer software programs to actual child selection. Participants were 19 4-year-olds. The Haugland and Shade (1990) evaluation instrument was used to assign DAP ratings to the software programs; children were then video- and audiotaped at the computers over one semester. Results showed: (1) some positive relationships between highly rated programs and children's preferences; (2) features identified in Haugland and Shade (1992), such as age-appropriateness, open-endedness, child-controlled or process-oriented, were present in the frequently selected programs, but some developmentally inappropriate software programs were preferred by children; (3) children preferred the software that provided the opportunity to interact, and interactions were the defining characteristic that motivated selections; and (4) male students chose to visit the computer area more frequently than female students. (Contains 26 references.) (Author/EV)

A Comparison of Child-Tested Early Childhood Education Software with Professional Ratings

Paper presented at the Annual National Conference of
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by
Theresa H. Escobedo, Ed.D.
&
Sharon Evans, Ph.D.

Department of Curriculum & Instruction
University of Texas at Austin
Austin, Texas

A Comparison of Child-Tested Early Childhood Education Software with Professional Ratings

Abstract

This study explored children's preferences of thirteen computer software programs and field-tested the relationship of developmentally appropriate (DAP) ratings of early childhood computer software programs to actual child selections in an early childhood computer curriculum. Questions were: 1. How do children's selection preferences relate to programs that were previously rated for DAP? 2. What features of the software can be identified to explain their preferences? 3. How do the ratings for DAP relate to children's interactions with the software, their peers, and their teachers? 4. What evidence is there of distinct gender preferences? The research was conducted at a university child care center in a four-year-old classroom. The sample included nineteen middle-class, culturally diverse children. The first phase of the research addressed the DAP of the thirteen software programs using the Haugland and Shade (1990) evaluation instrument. Interater reliability at the 90% level of agreement was found between those published results and the investigators' ratings. Data were collected during the Fall Semester with the software programs being available to the children every day. A computer assistant video- and audiotaped the computer activities and kept detailed notes. The second phase assessed children's preferences of software. Two researchers coded the children's selections, collated these to the DAP ratings of the software, and compared the findings with the software ratings found in the literature. Videotapes were transcribed, noting the children's language and their software choices and compared with the field notes. Results indicated the following: (1) Some positive relationships between highly rated programs and children's preferences were found. (2) Features identified in Haugland and Shade (1992) such as age-appropriateness, open-endedness, child-controlled or process-oriented were present in the frequently selected programs. Some developmentally inappropriate rated software were preferred by children. These programs featured familiarity, animation, music, surprise elements, and high interest topics and were the prevailing features in the otherwise developmentally inappropriate programs. (3) Children preferred the software that provided the opportunity to interact. Interactions were the defining characteristic that motivated selections and were all-inclusive in child-teacher, child-computer, child-child interactions. Most interactions were child-child and covered a large range of behaviors: supportive, helpful instructional behavior, non-supportive, critical roles, and play behaviors. Evidence of play behaviors included language, humor, pretend and imagination, and thinking and problem-solving. (4) Male students chose to visit the computer area more frequently than female students. Further field research is needed to closely observe the children's preferences and their subsequent behaviors to determine what is really beneficial to them and to examine possible reasons for strong male preferences towards computer activities.

Controversy surrounded computer usage with young children since the initial introduction of computers in early childhood classrooms and has continued to the present, though to a lesser degree. Early childhood educators and researchers have differed in views regarding the contributions or negative effects that microcomputers might have on children. At issue, has been the impact of computers on traditionally accepted play-based learning activities. Opponents point to the isolating effects of computer usage and the subsequent reduction of social interaction when compared to traditional activities. Also, concerns were raised about narrowly focused computer activities that perpetuate inappropriate views of children's abilities and an over-emphasis on the preparation for school at the expense of play and creativity (Kaden, 1990; Simon, l985). However, proponents of computer usage have argued that computers not only provide children the opportunity to acquire programming skills, but also the means of promoting problem-solving, creative thinking, and the ability to engage in various forms of symbolic representation, including symbolic play (Escobedo, 1992; Goodwin, Goodwin, & Garel, 1986). Others have reported that, instead of isolating children, computer competence contributed to social acceptance, willingness to share, and cooperative behavior (Clements, 1994; Kim,1985). A compromise statement is that computers can be beneficial to children when used in appropriate ways but can also be misused, just as any tool (Shade & Watson, 1990, cited by NAEYC, 1996).

Early childhood educators have shown a gradual, though guarded, acceptance of computer usage as increasing numbers of the machines are included in classrooms of young children; teachers have observed children interacting with computers and found them to increase motivation and to enrich environments (Haughland & Wright, 1997). Also, some research findings are identifying possible positive results and few negative effects. Comprehensive reviews of the literature reported various studies that indicate positive results related to gender, age, and thinking skills, as well as to content areas and the four major areas of development: social, emotional, cognitive, and physical (Clements,1987; Kaden, 1990). Cited as crucial to success, are the computer environment and the selection of software that meets the requirements established by the National

Association for the Education of Young Children (NAEYC) for developmentally appropriate practice in early childhood education programs (Bredekamp, 1987; Bredekamp & Copple, 1997). NAEYC (1996) adopted a position statement addressing technology and young children. One issue addressed emphasizes the importance of teacher participation in evaluating appropriate uses of technology; included is selecting developmentally appropriate software.

Currently, the literature indicates that while research supports the use of computers with young children, many educators are still hesitant. These educators are not convinced that computers add anything to early childhood classrooms that is meaningful or useful (Elkind, 1996; 1987; Mageau, 1993). Some researchers have observed play behaviors of children in computer environments based on drawing and coloring software programs. Play behaviors included acting out fantasy themes (Fein, cited in Simon, 1985) and play, ranging from exploratory play to constructive and imaginary play. (Escobedo, 1992). Yet, there are still questions about how playful children can be when using the computer as compared to other early childhood classroom play materials (Henniger, 1994). Bredekamp and Rosegrant(1994) reported concerns that early childhood educators expressed in letters to the National Association for the Education of Young Children (NAEYC). These letters reflected a strong opposition to computer usage for young children at the expense of motor sensory experiences that are traditionally a large part of children's preschool programs. The authors advocated an additive principle of education to break the gridlock of the two opposing views by incorporating computers in developmentally appropriate ways that add to, not replace, valuable early childhood activities and materials (Bredekamp & Rosegrant, 1994).

Despite lingering doubts and hesitations about computer usage with young children, computers are a fact of life. NAEYC (1996) acknowledged the widespread use of computers with young children and the trend indicating that the largest software growth recently has been in new titles and companies targeting the early childhood education market. Also, of people who own computers and have young children, 70% have purchased software for their children. Thus, it is easily seen that the question is no longer whether children be exposed to computers; instead, it is how to use computers with young children. The question of the beneficial or detrimental impact that computers have on young children is best answered by the observation that computers are neither good or bad; they are merely a tool such as crayons and pencils that can be used for various functions (Haugland & Shade, 1990).

For computers, the function is determined by the software programs used (Haugland & Shade, 1990). Thus, the answers to "are computers appropriate in early childhood classrooms" and "do children learn better using computers" depend largely on the kind of software used. The original controversy about contributions of computers for young children, ultimately comes down to the software selected. Early childhood educators who strive to have developmentally appropriate activities and materials in their classrooms, often do not ensure that computer software is also appropriate. This may be due to the lack of knowledge and training necessary to evaluate software. While there are various rating scales for evaluation of software and an emerging body of knowledge of such evaluation influenced by the work of Haughland, Shade, and Wright, the information is still slow in reaching consumers. Thus, there is limited information related to research that presents results regarding the differing effects of specific types of software. The purpose of this paper is to report the results of a study that investigated computer software usage in a preschool classroom and to present relevant literature findings.

Background

The review of relevant literature presented here forms the basis for the present research study and includes findings related to the effects of developmentally and non-developmentally appropriate computer software. Open-ended software programs that are process-oriented, such as Logo and drawing programs, have long been identified as desirable for young children. According to the NAEYC guidelines, use of only drill & practice software is inappropriate (Clements, 1994; NAEYC, 1996). Child control and open-endedness of the software activities are recommended as crucial features for developmentally appropriate software. However, one current problem with the majority of existing software is that it has a drill and practice format (Clements, D., Nastasi, B., & Swaminathan, S. 1993). Findings indicate that at least 75% of the available software is drill-based (Haugland & Shade, 1994). NAEYC (1996) stated that while many of the abundant new software make positive contributions to young childlren, an even larger number of them do not. Further NAEYC identified developmentally appropriate software as one that "offers opportunities for collaborative play, learning and creation " (p. 11).

Studies that focus on the outcomes of open-ended, developmental software, versus non-developmental, drill and practice software, have only recently begun to emerge. There are some research reports indicating that the kind of software that teachers select may have dramatic effects on how often children use computers and on their developmental gains in cognitive development and creativity (Haugland, 1992). The two types of software provide very different learning environments and appear to facilitate diverse developmental outcomes. One study addressed the effects of developmental software and non-developmental software on preschool children's intelligence, creativity, and self-esteem. Children were exposed to nine software programs three days per week for 27 weeks. Children exposed to developmental software had significant gains on cognitive measures. Children using non-developmental software, not only demonstrated significantly less creativity, but their scores dropped by 50%; this did not occur for children with the developmental software. Another finding was a difference in the time spent at the computer by the children in the non-developmental software group, spending three times as long as those in the developmental software group (43.36 minutes versus 14.35). Conclusions were that drill and practice software may have a detrimental effect on children's creativity and also had a mesmerizing effect similar to television, with children becoming passive reactors (Haugland, 1992).

Other researchers have focused on children's interactions and emotional responses in relation to types of computer software used. One study reported that the type of computer software used made a difference in children's interactions. In using developmental software, children were observed to formulate and solve their own problems in collaboration with a partner, evaluate their own work more positively, be more motivated and develop positive attitudes toward learning. Children exposed to non-developmental software exhibited more competitive behavior, avoided exchange of ideas, became more dependent on teacher assistance and became bored with paper and pencil work (Clements & Natasi, 1992).

Shade (1994) focused on children's emotional responses to developmental and non-developmental software. The most important outcome of this study was that regardless of age, gender, or social condition, children expressed no negative affect when presented with any type of software. Children's faces expressed a high degree of joy, interest, and surprise to all three levels of software appropriateness. Coupled with findings (Haugland, 92) that children spent three times as much time using non-developmental software, one may conclude that children are not very discriminating with computer software; they are drawn to the exciting potential of high interest software. Teachers, therefore, play an important role in carefully selecting good software that offers a rich world of exploration possibilities. As noted by NAEYC (1991) enjoying the curriculum is an important but insufficient criterion for curriculum selection (p.31).

The early childhood area has been recently targeted by computer software developers and many new and diverse programs for young children are emerging. While having a market brimming with available products is advantageous in providing a variety of choices, it is also confusing for teachers and parents. A survey of early childhood educators revealed that respondents expressed concern regarding the difficulties of selecting good-quality software. Selecting high quality software programs is a challenge not only because of their sheer numbers but also because software publishers describe the products in a manner that may be greatly different from how the program actually functions with young children. Reviewing programs is time consuming, cumbersome, and expensive (Shade, 1996). It is also difficult to evaluate some programs fairly until children use, or field test, the program. One study found that children responded positively to software even though it was inappropriate for them. The authors also strongly recommended that teachers child-test the software (Haugland & Shade, 1994).

Of the abundance of new computer software aimed at young children, only 20 to 25% is open-ended, discovery type (NAEYC, 1996; Haugland & Shade, 1994). In addition, even though several evaluation systems are available to help educators select appropriate software, access to these systems and their evaluations of software are not readily available. There is also a lack of studies reporting children's selections or preferences, even when the software has been rated for developmental appropriateness. Evaluation ratings of software by various systems and ratings by manufacturers may vary. While computer and early childhood experts can rate developmentally appropriate software, this is only one source in determining child benefits. Researchers also need to closely observe the children's preferences and their subsequent behaviors to determine what is really beneficial to them. Therefore, the objectives selected for this study were to explore children's preferences of thirteen computer software programs and to field-test the relationship of developmentally appropriate (DAP) ratings of early childhood computer software programs to actual child selections in an early childhood computer setting.

Methods and Procedures

Perspectives for the study emanated from the body of literature supporting developmentally appropriate practices for young children (Bredekamp, 1987; NAEYC, 1997). Included were the views of educators and scholars who support the appropriate use of computers in early childhood classrooms (NAEYC, 1996). The framework for the study was specifically based on evaluation of computer software for developmental appropriateness. The implementation of the study was guided by the following questions: 1. How do children's selection preferences relate to programs that were previously rated for DAP? 2. What features of the software can be identified to explain their preferences? 3. How do the ratings for DAP relate to children's interactions with the software, their peers, and their teachers? 4. What evidence is there of distinct gender preferences?

The Haugland/Shade Developmental Software Evaluation instrument and those available ratings of software published by Haugland and Shade (1990) provided the basis for analysis of the data. [This study was completed prior to publication of the Revised Haughland & Shade (1997) Software Rating Scale.] The investigators conducted a blind review of software using published ratings as a training technique to become competent in using the instrument. Thus, when published ratings were not available from Haugland and Shade, the researchers individually rated the non-rated software using the same evaluation instrument. Seven non-rated software of the thirteen software programs used in the study were rated in this manner (See Table 1). The formal criteria for DAP used by Haugland and Shade (1990) in the rating system were: 1) Age Appropriate, 2) Child Control, 3) Clear Instructions, 4) Expanding Complexity, 5) Independence, 6) Process Orientation, 7) Real-World Model, 8) Technical Features, 9) Trial and Error, and 10) Transformations. Each criterion could receive a score from 0 to 10. The highest possible score for each software would be 10. The most recently revised version of this scale (Haugland & Wright, 1997) was not yet available.

The research was conducted at a university child care center in a four-year-old classroom. The sample included nineteen middle-class, culturally diverse children who came from homes with professional career-track middle class parents. The first phase of the research addressed the DAP of the thirteen software programs used as part of the target preschool's early childhood curriculum (See Appendix, Computer Software References). Data were collected during the Fall and Spring semesters for one hour two times weekly. A computer assistant videotaped and audio taped the computer activities and kept detailed notes; data were collected during 14 sessions, half were of the morning sessions and half were of the afternoon. Coding forms retrieved information as to the number of selections made by each of the children for every software program. The computer was one of the various centers available in this classroom; centers provided were those typically found in most early childhood classrooms: the block and dramatics areas, art, manipulatives, writing center, et. cetera. The software programs were available to the children every day during the morning and afternoon center time ensuring that children had the opportunity to become familiar with each of the programs. Children were free to choose any of the centers in the classroom for any length of time during the free choice periods. Thus, while some children were working at the computer individually and/or as observers or advisors, the others were involved in activities at the other centers. An exception to free selection of activities was that of the computer center. In order to ensure that all children had equal access to the computer the teacher made a list of interested children who then had ten-minute turns working at the computer. They could choose any of the available software programs. By the time the study was initiated, ten programs were already installed in the Macintosh computer; three new ones were installed at weekly intervals so an not overwhelm the children and to let them become familiar with each addition.

The second phase of the study assessed the children's preferences of software. Two researchers compared the children's software selection preferences with the software ratings found in the literature when available; when ratings were not available, selections were compared to the investigators' own rating results. Investigators reviewed transcribed videotapes noting the children's language and their software choices and compared these with the field notes. The data sources consisted of transcribed tapes, field notes, the investigators' coding results of the software using the Haugland and Shade (1990) evaluation instrument, published software ratings, and results of children's selections coding forms. Analysis of the data was based on descriptive statistics, frequencies and percentages, and investigator observations.

Results

To answer the first question "how do children's selection preferences relate to programs that were previously rated for DAP?," frequencies and percentages were obtained of children's selections

(See Table 1 and Figure 1).

Table 1: Frequency Disbribution & Percentage of Software Programs Selected

	Software Program	Frequency	Percentage
1.	Backyard (BY)	12	11.4%
2.	Cotton Tale (CT)	2	1.9%
3.	Dinosaur (DI)	1	0.95%
4.	Early Learning (EL)	5	4.8%
5.	Kid Pix (KP) [b]	1	0.95%
6.	Peter Pan (PPN)	5	4.8%
7.	Playroom (PL)	14	13.3%
8.	Putt Putt (PPT) [a]	20	19.0%
9.	Putt Putt Fun (PPF)	4	3.8%
10.	Reader Rabbit (RR)	10	9.5%
11.	Sammy's Science House (SSH) [a]	15	14.3%
12.	Tree House (TH)	9	8.6%
13.	Thinkin Thing (TT)	7	6.7%
NOTE:	Total Frequencies and Percentage	N=105	100.0%

[a]n High Selection Frequency
[b]n Low Slection Frequency

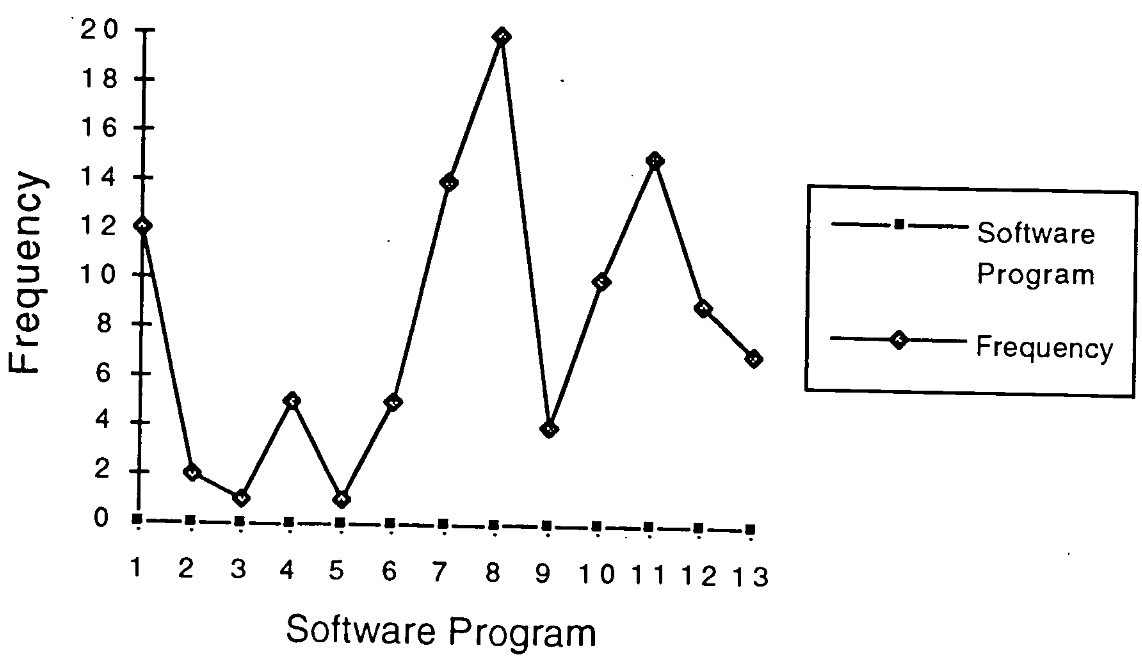

Figure 1. Children's Selection Frequency of Software Programs

Some positive relationships between highly rated programs and children's preferences were evident. The program that received the highest rating by both Haugland and Shade (8 on a 1-10 scale) and the researchers (8 on a 1-10 scale) was also the most frequently selected program by the children (20 out of 105 or 19%). However, there were some discrepancies as well. Some highly rated software programs were quite low on the children's selection; an example is Kid Pix as shown on Table 1.

Data for the second question "what features of the software can be identified to explain children's preferences?," indicated that features identified by Haugland and Shade (1992) such as age-appropriateness, open-endedness, child-controlled or process-oriented were present in the frequently selected programs. Some children preferred software that was rated developmentally inappropriate; examples are, Sammy's Science House and The Tree House as shown on Table 2.

Table 2. Comparison of Child Selection Rankings and Professional Software Ratings

Child Ranking	Frequency	Professional Rating
#1 - Putt Putt Joins the Parade	20	8.0
#2 - Sammy's Science House [a]	15	6.5
#3 - The Playroom	14	7.5
#4 - The Backyard*	12	7.0
#5 - Reader Rabbit's Ready for Letters	10	8.0
#6 - The Tree House* [b]	9	4.5*
#7 - Thinking Things, Collections #1*	7	9.0*
#8 - Peter Pan*	5	6.0*
#9 - Stickybear's Early Learning*	5	5.5*
#10 - Putt Putt Fun	4	8.5*
#11 - Cotton Tales*	2	6.5*
#12 - Dinosaur Adventure*	1	4.5*
#13 - Kid Pix [b]	1	9.5

Note. Asterisk indicates software rated by investigators of this study.

[a]n High Selections ranking, Low professional rating
[b]n Low selections ranking, High professional rating

These programs featured animation, music, surprise elements, and high interest topics. While these features were also present in the developmentally appropriate programs, they were the prevailing features in the otherwise developmentally inappropriate programs.

For the third question, "how do the ratings for DAP relate to children's interactions with the software, their peers, and their teachers", data were obtained to compare rankings developed from students' software selections, professional software ratings, and observed interactions. Of the total 13 software, the six highest Child Selection Rankings, as shown on Table 2, accounted for 84% of the total 105 selections made, frequency. Professional Ratings of these top favorite selections, with the exceptions of one, were all rated above 7.0 on the Haugland and Shade rating instrument. Further comparisons resulted in development of four categories (see Table 3):

Table 3. Comparisons of HIgh & Low Child Selection Rankings and High & Low Professional Ratings

Software	Comparison	Child Ranking	Professional Rating
	Comparison #1		
Putt Putt Joins the Parade		High-#1	High-8.0
Sammy's Science House			
	Comparison #2		
Dinosaur Adventure		Low-#12	Low-4.5
	Comparison #3		
Kid Pix,		Low-#13.	High-9.5*
	Comparison #4		
The Tree House		High-#6	Low-4.5*

Note. Astrick indicates results were inconsistent.

Category 1 compared high Child Ranking and High Professional Rating. Results indicated that the two highest Child Selection Rankings, Putt Putt Joins the Parade and Sammy's Science House, also had the two highest Professional Ratings. Category 2 compared low Child Ranking and low Rating, and results showed these to be consistent. Inconsistent results were obtained for Category 3, in that the highly rated Kid Pix, rated 9.5, had the lowest Child Ranking, #13. However, the next lowest Child Ranking, #12 - Dinosaur Adventure, also had a low Professional Rating, 4.5. Category 4 compared high Child Ranking and low Professional Rating. Results indicated that one of the higher Child Ranking, # 6, The Tree House, was given a low Professional Rating. Comparisons of these four categories indicated that Category 1, high Rank, high Rating, had the highest children interactions by virtue of selection frequency. However, one software in Category 4 with low Rating but high child Ranking also had a high frequency and was among the software that accounted for 84% of the total selection frequency.

Question #3 analysis, ratings related to interactions, also included descriptive data, the field notes and transcribed children's interactions as indicated by their language; results indicated that children preferred the software that provided the opportunity to interact. Thus, interaction seemed to be the defining characteristic that motivated children's selections. Child interaction was related to the ratings and criteria established by Haugland and Shade. Age appropriateness was very important as shown by the low selection of Kid Pix by four-year-olds, a software otherwise acclaimed by older children. Interaction data were divided into three Interaction Categorizes: 1) child-child interactions 2) child-software /computer interactions , and 3) child-teacher interactions. Most of the interactions were child-child and, to a lesser degree, child-teacher. Interaction with the software was evident as shown by frequency of selections and was also impacted by child-child interactions. However, there were instances of pure child-software / computer interaction. Child-child interactions covered a large range of behaviors, from supportive, helpful instructional behavior, to play behaviors that included pretend and imagination, and to non-supportive, critical roles. Examples of interactions taken from the field notes and the language follow:

Child-computer interactions

Child-software/computer interactions occurred more often than would be expected and included personification, treating the computer as a peer. Computer interactions often revealed inclusion of other children but also showed children working alone. These were evident in the field notes and children's language data described below.

Field notes data:

Child #19, male, had one of the highest frequencies of computer use. On this occasion he was observed using the Reader Rabbit software and appeared happy as he moved body in dancing motions. He then stood up and danced with a male friend. This occurred often when there was music and included much laughing and talking with friends and the teacher.

Child #15, male with frequent use of computer. Was observed using the Tree House. He talked briefly to watchers but concentrated on changing the activities. He then stood up, moved his ear toward the monitor, and talked to the computer.

Child #2, male, had the other highest frequency of computer use. He was the only one to use Kid Pix on one occasion for 8 minutes, working alone.

Child #11, female, had one of the higher female frequencies. She was observed using the Tree House with two boys and one girl watching briefly. She clicked randomly, moving in and out of the activities quickly and seemed frustrated because she didn't know how to play them.

Child language data: random comments to the computer, various children.

Child: Yes! Oh, she doesn't move. Oh, there it is. She doesn't move. That's funny. Not again. I knew it!

Child: Yes, yes, yes sir. Yes sir. Oh, wow. Go back to the basket. Go back to the basket. Whispers to monitor.

Child: Bye Bye. See you Putt Putt. See you bird, bird, bird, bird.
Hey ya, Hey ya,----(self noise)

Child - Teacher Interactions

These often were related to procedural questions or to calls for aid.

Field notes - Aid requested

Child #2, high frequency, preferred to work alone. Was observer using Peter. He needed Observer to read the sentences for him. If she stopped reading, he would turn and ask "What does it say?"

Child #18, female, low frequency user. Was observed using Peter Pan. At first the Observer asked, " Do you want me to read the sentences for you?" She answered yes but while the reading occurred she did not listen and kept clicking objects on the screen. Therefore, the Observer stopped reading but she did not notice.

Child language data:

Observer:	(Invited Child #18 to play on the computer twice; she declined.)
Child #18	(On another day) I played on the computer yesterday.
Observer:	Good, do you want to show me today?
Child #18	Yes. (When she had a turn, she switched Peter Pan to Playroom.)
Child #18:	This is my favorite one. Can I have this game on my daddy's computer?
Child #7:	(Moderate male user, often said) I want to get out of this game. (Chose Sammy's Science House)

Procedural language, random samples

Child:	K. E., I was going to after S. She is going to (*go) after me. But Linda said I can go (*next) after (*S.). I has to go to (*next). I can't see , K. E., K. E., I can not see.
Teacher:	It's time to take a nap, guys.
Various:	I didn't get my turn. But I didn't get my turn.
NOTE	When Observer asked boys to play on the computer, they always said yes and walked quickly to the computer. But when she asked girls , they almost always said, " No, I don't want to." or, " Till I finish playing this."

Child-Child Interactions

Child-child interactions dominated the language data, which also affected the Computer and Teacher Interactions categories. In order to analyze the peer interactions data, further organization was necessary and sub-categories were added in order to make the data more meaningful. Child-Child interactions provided some interesting incidents as seen in the following:

Supporting

An audience proved to be supporting as in the next incident.

Child #1: (male, low user, high interest, playing with Putt Putt)
Watch this, watch this.
Watchers: Click that one. Now that one. (Enjoyed input but tired of it.)

Random examples of supportive language:
1st child: I want to push here.
2nd child: Do the kitchen, Emily.
1st child: Freezer-, freezer.
2nd child: That's it. Now, play (*not clear). That's it. That's it. Yes!

1st child: Do the frog, frog, frog. (On Putt Putt)
2nd child: I want to do the frog.

1st child: See-. Wait until his tongue comes out. Gotcha-. He won. We won, S.

Critical, Non-supporting

Field Note: Child #4, female, low frequency user. Was observed using Putt Putt after Child #1 and Child #19, both males who received many supporting comments from watchers. However, when her turn came, the males who had been around and no one watched her play.

Random examples of non-supportive language:
1st child: I'll do it. A little (*to this)
2nd child: No, you are wrong.
2nd child: I want to do this.
1st child: We don't want any clown.

1st child: Watch. Look, look how it looks. Look how it (*goes).
2nd child: Look how he takes it. Now do this. Push that.
1st child: That will go backwards.
2nd child: Yeah, it go backwards. That doesn't go there. See, it go right there. Don't keep doing that (*). See, you did it wrong. Put, put--put, put it that one.

Instructing

Child #9, female, one of the highest frequency users. Was observed using the Tree House. She asked a male to help her, another two boys watch. One boy taught her all the way; the other 2 boys left.

Child #9: This time I'm gonna do the drop one, ok?
Helper One more push down here.
Child #9: I want to get out of this one.
Helper Press that.
Child #9: I want to get out.
Helper: OK. Press that. No, press that. Come on. Go-go-go-... .
(repeated 13 times)

Random example of instructional language:

1st child:	Micky Mouse on the tree house (singing)
2nd child:	Click Here.
1st child:	It's time to click that to see to the (*not clear) is, ok?
2nd child:	No, click that.
1st child:	The next one. Click it, ok? Now?
2nd child:	Yes, now!
1st child:	Yeah, that, click.
2nd child:	You can do it again.
1st child:	What do I do now?

Demonstrating, heuristic

Child #1, male, high interest. Was observed using Putt Putt: He often talked when he played and others played with him.

Child #1:	Watch this, this will be really funny. (Other boys are waiting and watching.) Do you want me to do that again?
2nd child:	yes
Child #1:	OK, I'll do it. (He laughs and looks back at his friend) Watch. Look, look how it looks. Look how it (*works). Look how he takes it.

Play:

The data in this sub-category proved to be too extensive and broad. In order to describe the results with more detail, it was further subdivided. Therefore, the areas of play evident in the language were separated as per Gottfried's, (1985) definitions: language, humor, imagination, or thinking and problem-solving. Construction with objects was not as viable as the software used were not drawing or painting. An exception was Kid Pix, an excellent drawing program, but one that was not child selected to any extent.

language, humor,

1st child:	Watch this. He'll pull the worm out and then he'll, he'll get stuck. He'll, he'll, his face will get stuck. And then he'll come out, ok?
See,	hee----(laugh).
2nd child:	He got it (laughing).
1st child:	It's funny.
2nd child:	Do it again.

imagination, pretending

1st child:	I didn't get the butter. I didn't get it. Right there. Wow! Wo-w. Hey, look at the cookies. Um. Um. (Pretends to eat the cookies.).
2nd child:	Oh-o! Oh- no-. Candy, apple?
1st child:	There's two of those. (*Let's) put on the stove.
2nd child:	(*Put) in the stove?
1st child:	uh-hun.
2nd child:	How to put on the stove.

thinking and problem solving

1st child:	You know what? When I go mow--(Thinking ahead - Putt Putt)
2nd child:	You want to get a flat tire? and then you could honk, then-- Push this. Honk! Honk! Get out of here. Come on. Get out of here.
1st child:	I need to get the magnet first. I need to get the magnet. And I need to get the magnet.
2nd child:	I already know.
1st child:	Over here. Now, in here. First, first (*we) get the magnet.
2nd child:	First thing, you need to get the magnet. And then you get the mail box. ok? [Later Putt Putt needs the magnet to get the nails out of the way.]

For the fourth question, "what evidence is there of distinct gender preferences?", the data indicated that male students chose to visit the computer area more frequently than female students. Of the 81 visits made by all children, the males accounted for 51 visits or 63% of the total visits. See Figure 2.

Figure 2: Comparison of Frequency Distribution of Male/Female Visits

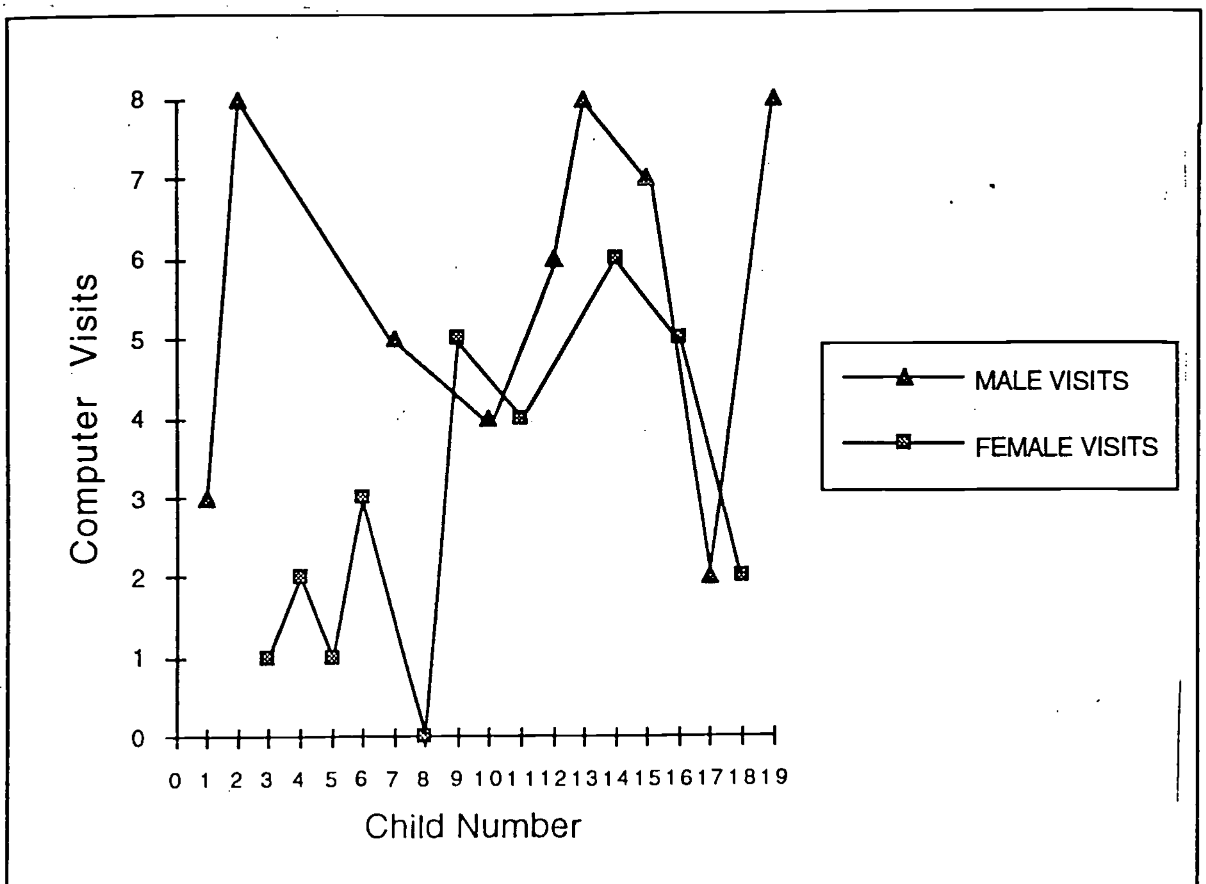

Figure 2: Comparison of Frequency Distribution of Male/Female Visits

The descriptive analysis of field notes and of the interactions language also supported this finding.

Discussion and Conclusions

Results from this study indicated that children's software selections often coincided with ratings done by professionals. However, this finding was tempered by the fact that children sometimes show a preference for software rated low in DAP. This result supports the findings of others who reported that children may respond positively to software even though it may be developmentally inappropriate for them; the authors strongly recommend that teachers child-test the software (Haugland & Shade, 1990, 1994; Hohmann, Carmody, & McCabe-Branz, 1995). Additionally, this study found that high ratings by professionals are not always related to children's selections, indicating that child testing of computer software programs is crucial to final ratings. Features of the most often selected software and the most preferred software were those that offered child-control and were easily manipulated. Popular software also featured animation, music, surprise elements, and high interest topics. These features were preferred by the children whether the software programs were developmentally appropriate or not, but were the prevailing features in developmentally inappropriate programs.

Outcomes of the study showed that children preferred the software that provided the opportunity to interact. Interactions were the defining characteristic that motivated selections and were all-inclusive. Most of the interactions were child-child, to a lesser degree, child-teacher, and child-software / computer interactions. Child-child interactions covered a large range of behaviors: supportive, helpful instructional behavior, non-supportive, critical roles, and play behaviors. Examples of interactions evident in the descriptive data met the NAEYC (1996) specification that appropriate software offer opportunities for collaborative play, learning, and creation. Evidence of play behaviors reflected Gottfried's (1985) definition with evidence of language, humor, pretend and imagination, and thinking and problem solving.

Other studies have also reported that preschool male children are more attracted to using computers and interested in how computers work (Escobedo, 1992); this was supported by findings from this study. The reason for this difference has not been noted and could be that teacher expectations or behaviors affect this aspect. An interesting possibility might be the adult role models set in the classroom (male and female models for competence, interest, dialogue, trouble-shooting attitudes, etc.). Another possibility appeared to be peer influence; as males saw their friends involved with the computer activities, they frequently moved to that area. It was interesting to note that a parent of a female student, who was infrequently involved with computers at school, said that she was very active with some of the same software used on her home computer. Peer models may play an important role, as well.

In general, it can be concluded that an abundance of new software aimed at young children is being produced, yet comprehensive evaluations of these programs are not readily available. There is a need for further studies such as this one to further explore appropriateness of software that target the early childhood area, as pointed out in the literature (NAEYC, 1996; Shade, 1996) The lack of research, reporting children's selections or preference of software, points to a need in this area. Therefore, further research related to child-testing of software and child preferences of previously rated software, similar to this one, would add to the emerging knowlede of software effects on young children. This study also supported other findings in the literature indicating that while early childhood experts can rate developmentally appropriate software (according to NAEYC guidelines), this is only one source in determining the effectiveness of software. Researchers also need to closely observe the children's preferences and their subsequent behaviors to determine what is really beneficial to them.

Observations made during the study pointed to the need to further expand the Developmentally Appropriate Guidelines to include the social and cultural contexts in which children live to ensure meaningful experiences. These observatons emerging form the study were made prior to the revised edition of the NAEYC (Bredekamp & Copple, 1997) guidelines and to the Haughland/Shade Developmental Scale Revised Edition (Haughland & Wright, 1997) which now address this area. A major perception was that child testing of software should be done with a similar population of children as those who will be using the software. The children in this study may have very different experiential backgrounds than those of a class from a different socio-cultural background. What may be a "Real-World Model" (criterion #7 in the Haugland & Shade evaluation system) for one population, could be foreign to another population. Another observation had to do with the weight given to the items in instrument used. Since all the items on this particular rating system are weighted equally, a potentially low score (0) on this one criterion would only lower the entire DAP score by 1, still giving it a possible very high score of 9. Therefore, Criterion #7 might be weighted differently to accurately reflect its importance. If a software program is not a "Real-World Model" for children it is serving, it may not be a good selection at all; regardless of its overall rating. While these types of systems provide a good framework for objectively looking at developmental appropriateness, they must be individually tailored to the target population and the DAP criteria must be examined one by one in a subjective manner. Software evaluation systems can continue to be valuable tools to educators when they are accompanied by a directive for field-testing and guidelines for adaptations to serve diverse populations.

APPENDIX A

Computer Software References

Listed in this appendix, are the software programs used for this study.

Title	Publisher
The Backyard	Broderbund Software
Cotton Tales	MindPlay
Dinosaur Adventures	publisher unknown
Kid Pix	Broderbund Software
Peter Pan	EA*Kids
The Playroom	Broderbund Software
Putt Putt Fun	EdMark Corporation
Putt Putt Joins the Parade	EdMark Corporation
Reader Rabbit's Ready for Letters	The Learning Company
Sammy's Science House	EdMark Corporation
Stickybear's Early Learning Activities	Stickybear Software
The Treehouse	Broderbund Software
Thinkin' Things-Collection I	EdMark Corporation

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Author's Notes

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Sharon Evans, Ph.D., Director, Student Placement Ofs.

Organization/Address:
The University of Texas
Early Childhood Education
SZB 244
Austin, TX 78712

Telephone: 512 471-4089
FAX: 512 471-8460
E-Mail Address: thesco@mail.utexas.edu
Date: 6/7/97

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