THE EFFECTS OF COMPUTERS ON KINDERGARTEN CHILDREN'S SOCIAL SKILLS

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Abstract
The purpose of the study was to examine the effects of computer use on children's social skills in kindergarten. Early Childhood Longitudinal Study-Kindergarten Class of 1998-99 (ECLS-K), conducted by National Center for Educational Statistics, was utilized to analyze differential effects of home and school computer use on kindergarten social skills gains. The sample included 12,929 kindergarten children. Results indicated that children who use computers more proficiently demonstrated less problem behaviors and better social skills, rated by their teachers.

Theoretical Background
With the emergence of information technology, the number of personal computers in the home has increased drastically in the past two decades. According to the U.S. Census Bureau (2001), the number of households in the United States that owned personal computers in the year 2000 is 51%. It is quite an increase from 8.2% in 1984. Various demographic and socioeconomic factors such as income, family size, location of residence, and the presence of a child in the household were associated with home computer ownership. By the year 2000, 65% of children who were 3 through 17 years of age in the United States lived in a household with a computer (National Center for Education Statistics, 2003). A recent survey found that young public school children with access to home computers used them 3 to 4 days a week with the purposes of use varying by children's gender, ethnicity, and family SES.

The numbers are more affirmative when the access to computers at school is scrutinized. By the end of 1990's, the nationwide ratio of students to instructional computers was 6 to 1 and the Internet access in public schools was 95% (Snyder & Hoffman, 2002)

Computer technology offered great amount of possibilities in the early childhood settings as well and the potential value of a personal computer in early child development has been debated consistently among both practitioners and researchers for many years. Building upon the work of educational researchers and practitioners, the National Association for the Education of Young Children (NAEYC) has acknowledged that computers can enhance young children's learning and collaborative experiences with peers and has issued guidelines for selecting software and using computers in the classroom (NAEYC, 1996).

Computers are viewed as having tremendous potential to benefit young children when they are used in a developmentally appropriate way (Haugland, 1999; Haugland & Wright, 1997). Used in appropriate ways, the computer is an invaluable resource that fits children's learning style. It also has a unique potential to provide scaffolding opportunities enabling children to successfully explore and master tasks that would be impossible without a computer (Char, 1990). Furthermore, it also provides teachers a unique opportunity to access information and reach other people to share the knowledge.

Research has gradually addressed the concerns regarding the potential dangers and benefits of computers for young children. Research confirms that it is not computers, but the type of computer experiences provided to young children that determine whether computers enhance or inhibit development (Clements, Nastasi, & Swaminathan, 1993).

Opponents of computer utilization and computer advocates have made very different claims regarding how computers affect the child. Opponents fear computers will replace other early childhood activities, such as children's experiences with blocks, sociodramatic play area or art media (Barnes & Hill, 1983). Computers take children away from the real developmental tests of the young children (Turner, 1992). Exposing children to the power of computers may cause their thinking to be dominated by computers, rather than children developing a better understanding of themselves and the world (Haugland & Wright, 1997).

Opponents have also feared that computers will push children to learn skills they are not ready to learn. Elkind (1985) mentioned that computers pull them away from valuable play experiences as teaching machines used for drill and practice, programmed instruction. Literature today shows that if computers are used in developmentally appropriate ways they meet young children's needs (Haugland & Wright, 1997).

One of the major critics to computers is that they would cause children to have less interaction and lead to a generation of social isolates (Barnes & Hill, 1983). Children who spend time at computers would not build the social skills so important to their overall growth and development.

However, research confirms that there are as many social interactions around the computer as in other activities within the classroom (Clements, Nastasi, & Swaminathan, 1993; Haugland, 2000; Lipinski, et all, 1986). Computer area provides many opportunities to children for interaction with peers and the teacher as discussing what they are doing, asking for help, exploring a program together, etc. Cooperative Learning provides the guidelines of interactive practices on which curriculum makers can build the computer activities (Johnson, Johnson, & Holubec, 1993). Research shows that children also prefer working with a peer to using computer alone. Thus, rather than creating social isolation, it is suggested that computers provide children opportunities to build social skills (Haugland & Wright, 1997). Thus, this research aimed to examine the differential effects of several computer variables, such as owning a home computer, frequency of using computers, and using computers for instructional purposes, on kindergartner's social skills measured by the Social Skills Rating System (Gresham & Elliott 1990), utilizing the data from ECLS-K.

Data Source

This research utilized data from the Early Childhood Longitudinal Study-Kindergarten Class of 1998-99 (ECLS-K), conducted by National Center for Educational Statistics (NCES). The ECLS-K is a "multi-source, multi-method study that focuses on children's early school experiences beginning with kindergarten" (US Department of Education, 2000, p, 1-1). The ECLS-K provides data from a nationally representative sample of children from kindergarten through fifth grade. A total of 22,782 children throughout the US are sampled in the study and it assessed children directly or indirectly in 1,277 schools which offered kindergarten programs during the 1998-99 school year. It was expected to better describe and understand the effects of computers on children's social skills with this data because when used with appropriate sample weights (provided by NCES), results from the ECLS-K data are generalizable to the United States' population of kindergarten children, teachers, and schools offering kindergarten programs in the 1998-1999 school year. The final sample for this study included 12,929 kindergarten children.

There are several unique advantages of using the ECLS-K that were utilized in this study. First and most, ECLS-K is the first and currently the only available large-scale database which is nationally representative of the status of the young children from kindergarten to the early years of elementary schooling. It provides invaluable nationally representative data on children's status at entry into school and their progress through fifth grade. Therefore, results of this study can be generalized to the U.S. population of kindergarten and first grade children, teachers, and schools.

Results

The relationship between social skills, measured by the Social Skills Rating System (Gresham & Elliott, 1990), and three main variables of children's computer use in kindergarten has been scrutinized for this study. Basic descriptive analyses for scales are presented in Tables 1, 2, and 3 regarding the child's gender, race, and the status of home computer ownership, respectively. Oneway analysis of Variance (ANOVA) results showed significant differences only for the race variable. Asian children consistently gained more on Approaches to Learning (M=0.18, SD=0.52), Self-Control (M=0.11, SD=0.52), and Interpersonal (M=0.23, SD=0.54) skills. They showed the least amount of increase in Externalizing Problem Behavior (M=0.02, SD=0.42), and the only decrease in Internalizing Problem Behavior M= -0.01, SD=0.44) scales.

Table 1
Means and Standard Deviations for SSRS Gain Scores by Gender

Gender		Approach to Learning	Self-control	Interpersonal	Externalizing Problem Behavior	Internalizing Problem Behavior
Male	Mean	.12	.08	.14	.06	.04
	N	6501	6269	6107	6399	6307
	SD	.53	.55	.55	.51	.48
Female	Mean	.13	.09	.15	.05	.03
	N	6428	6165	6142	6330	6268
	SD	.50	.51	.54	.43	.49
Total	Mean	.13	.08	.15	.05	.03
	N	12929	12434	12249	12729	12575
	SD	.52	.53	.55	.47	.48

Table 2
Means and Standard Deviations for SSRS Gain Scores by Race

Child composite race		Approach to Learning	Self-Control	Interpersonal	Externalizing Problem Behavior	Internalizing Problem Behavior
Caucasian	Mean	.12	.08	.13	.03	.02
	N	7748	7507	7418	7646	7601
	SD	.50	.51	.54	.44	.46
African-American	Mean	.09	.03	.11	.10	.08
	N	1710	1650	1626	1688	1640
	SD	.53	.56	.56	.53	.50
Hispanic	Mean	.14	.09	.16	.07	.03
	N	2078	1943	1900	2023	1985
	SD	.54	.54	.56	.49	.52
Asian	Mean	.18	.11	.23	.02	-.01
	N	812	768	747	797	778
	SD	.52	.52	.54	.42	.44
Others	Mean	.12	.07	.12	.05	.06
	N	563	548	540	558	553
	SD	.50	.54	.53	.51	.47

Table 3
Means and Standard Deviations for SSRS Gain Scores by Owning a Home Computer

Have home computer child uses		Approach to Learning	Self-Control	Interpersonal	Externalizing Problem Behavior	Internalizing Problem Behavior
Yes	Mean	.13	.09	.15	.04	.03
	N	7465	7222	7136	7373	7291
	SD	.51	.52	.54	.45	.47
No	Mean	.1169	.0751	.1355	.0732	.0378
	N	5464	5212	5113	5356	5284
	SD	.53	.54	.56	.49	.50

Other two main variables of interest were the frequency of children's home computer use and children's level of proficiency in using computers, reported by the teachers. Responses for the frequency of computer use at home ranged between *never* and *every day*, whereas the level of proficiency was reported on a scale of responses between *not yet* to *proficient*. Level of proficiency resulted in significant ANOVA differences between groups for all subscales. As it can be seen in Table 4, children rated as ***proficient*** by their teachers demonstrated better results in all five scales than the other four groups. Results of the oneway ANOVA, is presented at Table 5.

Table 4
Means and Standard Deviations for SSRS Gain Scores by Computer Proficiency

Uses computer for variety of goals		Approach to Learning	Self-Control	Interpersonal	Externalizing Problem Behavior	Internalizing Problem Behavior
Not yet	Mean	.09	.08	.13	.06	.04
	N	515	466	443	492	488
	SD	.59	.58	.54	.52	.56
Beginning	Mean	.05	.03	.10	.08	.08
	N	1719	1638	1605	1699	1673
	SD	.52	.53	.54	.50	.51
In progress	Mean	.10	.07	.12	.06	.04
	N	3528	3385	3350	3450	3408
	SD	.51	.52	.55	.47	.48
Intermediate	Mean	.13	.07	.1413	.04	.02
	N	3134	3054	3016	3086	3059
	SD	.51	.52	.54	.44	.45
Proficient	Mean	.20	.15	.20	.01	-.01
	N	2002	1965	1946	1988	1972
	SD	.48	.52	.53	.44	.46

Table 5
Oneway ANOVA Results for Effects of Computer Proficiency on Social Skills Scales

	df	Mean Square	F	Significance
Approaches to Learning	(4, 10893)	5.67	21.41	.001
Self-Control	(4, 10503)	3.48	12.48	.001
Interpersonal	(4, 10355)	2.90	9.67	.001
Externalizing Problem Behavior	(4, 10710)	1.17	5.33	.001
Internalizing Problem Behavior	(4, 10595)	2.02	8.67	.001

Correlations among the scales are provided in the Table 6. Because of the relatively high correlation among social skills scales and behavior problem scales, two separate Multiple Analysis of Variance (MANOVA) tests applied to the data. Multiple analysis of variance (MANOVA) is used to see the main and interaction effects of computer use in kindergarten on five social skills variables; approaches to learning, self-control, interpersonal skills, externalizing problem behaviors, and internalizing problem behaviors. For the first MANOVA analysis, where Approaches to Learning, Self-Control, and Interpersonal skills were the outcome variables, the multivariate main effects for computer using proficiency, Wilks' lambda = .99, $F(12, 26751) = 4.53$, $p<.001$, was accompanied by significant univariate effects on all three subscales.

Table 6
Correlations among SSRS Scales

	Self-Control	Interpersonal	Externalizing Problem Behavior	Internalizing Problem Behavior
Approaches to Learning	.48 (12241)	.54 (12242)	-.29 (12270)	-.23 (12565)
Self-Control		.62 (11948)	-.43 (12288)	-.18 (12151)
Interpersonal			-.35 (12126)	-.23 (12016)
Externalizing Problem Behavior				.22 (12446)

All correlations are significant at the 0.01 level (2-tailed). Numbers within parentheses indicate sample size.

The multivariate main effects for having a home computer, Wilks lambda = 1.00, $F(3, 10111) = .14$, $p > .05$, and the frequency of computer use, Wilks lambda = 1.00, $F(12, 26751) = .16$, $p > .05$, were not significant, supporting the results of univariate effects. Results of the first MANOVA is presented in Table 7. Students who were proficient in using computers, as rated by the teacher, had better scores on each of the five SSRS scale.

Table 7
Multivariate and Univariate Analyses of Variance for Social Skills

	Multivariate	Univariate		
	F	Approaches to Learning Gain	Self-Control Gain	Interpersonal .Gain
Home Computer	.14 (3, 10111)	0.28	.06	.32
Computer Frequency	.16 (12, 26751)	.11	.18	2.36
Computer Proficiency	.99* (12, 26751)	10.50*	4.52*	5.33*

Note: Multivariate *F* ratios were generated from Wilks' Lambda. *p< .05

Table 8
Multivariate and Univariate Analyses of Variance for Problem Behaviors

	Multivariate	Univariate	
	F	Externalizing Problem Behavior Gain	Internalizing Problem Behavior Gain
Home Computer	6.65* (2, 10467)	12.48*	.01
Computer Frequency	2.09 (8, 20934)	.15	3.48
Computer Proficiency	2.75* (8, 2932)	4.87	5.20*

Note: Multivariate *F* ratios were generated from Wilks' Lambda. *p< .05

Students who had a home computer, more frequently were rated lower on the externalizing problem behavior scale (M=0.3 vs. M=0.7) by their teachers. Children who used computers at a proficient level were the only group who demonstrated a decrease in internalizing problem behavior scale, whereas children from all other four efficiency groups showed some increase.

Educational Importance

Computers have a big potential for both children and teachers in the field of early childhood education. Furthermore, research confirmed that when computers are located in the classroom, rather than in a computer lab, a child's developmental gains from using appropriate software are significantly greater (Davis & Shade, 1999). However, computers' success mainly depends on how they are used. Particularly, possible negative effects of computers on children's social skills are commonly argued in the field because of the fact that computers are generally used in isolation (Barnes & Hill, 1983) by each child. How the computer is used in the classroom directly affects its ability to support development. Research has shown that children value peer

interaction while using computers and that the social effects are "overwhelmingly positive" (Rhee & Bharnagri, 1991; Bergin, Ford, & Hess, 1993; Clements, 1994). Research has also shown that computers provide valuable support to young children's language development (Clements, 1994). Thus, when computer are placed in a central location, they support both social interaction and children's language development.

Results of the present study provided supporting evidence to the proponents of computer use in kindergarten classrooms. Results indicated that positive effects of computers on children's social skills in kindergarten depend on the level of proficiency in using one. Children who used a computer more proficiently demonstrated more positive social skills and less problem behaviors. On the other hand, owning a home computer that is available to the child's daily use did not have any significant effect on positive social skills. The only effect of owning a home computer was observed on the externalizing problem behavior scale where children who had a home computer exhibited less problem behaviors. Computer using frequency had no effects on either the positive social skills or the negative problem behaviors. Children who vary in daily computer using frequency did not differ in the aforementioned skills demonstrated. It is essential to notice that using computers more frequently in kindergarten did not result in any negative social behavior as it was argued in the previous research.

These results provide more insight to the issue of computer use in kindergarten. Opponents of the computer use in kindergarten level supports the notion that young children who use computers heavily will spend less time on other more developmentally rewarding activities. However, this argument and the suggestion by some scholars' that computers foster social isolation in young children do not appear to be true against the empirical findings of this study. Children who use computers more frequently and at a more proficient level demonstrated more social skills gains and less problem behaviors gains in the kindergarten year. Further research to investigate social effects of computers controlling for family variables such as income, education level, and parenting types is suggested.

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