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AUTHOR	Din, Feng S.; Caleo, Josephine
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ABSTRACT

This study investigated whether kindergarten students who played Sony Play Station (Lightspan) computer games learned better than peers who did not play such games. Participants were 47 African-American kindergartners from two classes of an urban school in the Northeast. A pretest and posttest with control group design was used in the study. The experimental group played the games for 40 minutes per day in school for 11 weeks. The Wide Range Achievement Test-R3 was used for measurement. Findings from data analysis via ANCOVA indicated that the experimental group made significantly more gains in the spelling and decoding areas. No difference was found in the math area. (Contains 19 references.) (Author/EV)

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Playing Computer Games Versus Better Learning

Feng S. Din

William Paterson University

Josephine Caleo

William Paterson University

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of the Eastern Educational Research Association,
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Abstract

The study investigated whether kindergarten students who played Sony Play Station (Lightspan) computer games learned better than peers who did not play such games. Participants were 47 preschool age children from two classes of an urban school in the northeastern region. A pretest and posttest with control group design was utilized in the study. The experimental group played the games for 40 minutes per day in school for 11 weeks. The Wide Range Achievement Test-R3 was used for measurement. Results from data analysis via ANCOVA indicated that the experimental group made significantly more gain in spelling and decoding area. No difference was found in math area.

Playing Computer Games Versus Better Learning

In recent years, computers have become an increasingly popular learning tool, especially with young children. Some educators believe that enhancing the capability of young children through computer applications can provide a basis for more effective and efficient learning in the formal school setting (Fitch & Sims, 1992). To understand whether and in what aspects the use of computer-related technology benefits young children, researchers have been conducting investigations.

The research literature provides knowledge on the impact of use of computer-related technology on young children's social, psychological, cognitive development, and academic learning. With respect to how young children with/without computer experience view computers, Fitch and Sims (1992) found that those who worked on computers understood it better, viewed it more positively, and related computers to learning more strongly than the group without computer experience did. With a different focus, Williams and Ogletree (1992) studied the gender differences in computer interest and competence in preschool children, and the relationship of these variables to gender role concepts. They found little evidence for the masculine stereotyping of the computer, or for greater male competence or interest.

Some researchers have investigated if minority students can benefit from using computers. Whether "at risk" minority students can learn to use basic Logo commands was studied by Allen, Watson and Howard (1993). It was found that young minority students from economically deprived background could learn to successfully program Logo when the concepts and command procedures were presented at developmentally appropriate levels. In another study, Emihovich and Miller (1988) examined how minority students' learning styles could be matched with computer instruction, and its effects on their achievement, reflectivity, and self-esteem. The results showed that the Logo minority students outscored the Logo majority students in math achievement.

How well young children handle various computer devices constitutes an important issue to educators, such as: the use of a mouse to control a graphical interface. Crook (1992) studied the tasks that embody the basic skills underlying mouse-based control of a computer interface. The younger children in the study were found to be disadvantaged by having difficulties in repositioning the mouse on the working surface while keeping the screen pointer fixed. No gender related differences were found at any age. In a similar study, King and Alloway (1992) measured the efficiency of young children's use of common input devices and the preferred input device. The mouse was found to be more efficiently used than the joystick was, which in turn was more efficiently used than the keyboard was. There was no significant difference between gender group's interaction with input devices. The findings also indicated that boys selected the computer activity more often than the girls did.

How young children behave in the use of computer-related technology is an important topic in the literature. Wright, Seppy and Yenkin (1992) examined the impact of the use of digitized images on young children. The results indicated that the children replayed the digitized image version more often, and their cognitive focus was stronger on the "real" animals. In a similar investigation, Min (1996) explored the impact of interactive multimedia use on young children's behavior. The findings revealed that multimedia technology with its use of video, audio and graphics could engage children for a longer period of time. With a similar focus, Orth and Martin (1993) examined student temperament, instructional method (computer vs. teacher) and the interaction between the two on student off-task behavior and problem-solving performance. Their results indicated that students with lowest task orientation showed significantly more off-task behavior with teacher-directed instruction than with computer-directed instruction. Pursuing a similar issue, Fein, Campbell and Schwartz (1987) studied the impact of computer use on children's behavior in preschool classrooms. They found that there were less unoccupied behavior, less interactive and more parallel play when computers were in the classroom. Solitary or constructive activities were not modified by computers.

A number of studies have been conducted to investigate the effects of computer software use on cognitive development of young children. In a study by Clements and Gallo (1984), the effects of learning computer programming on children's cognitive style, metacognitive ability, cognitive development were assessed. The results indicated that the computer programming group scored significantly higher on measures of reflectivity, two measures of divergent thinking, and metacognitive ability. The results revealed no difference on measures of cognitive development. In a similar pursuit, Park and Clements (1995) investigated the development of the ability to recognize, anticipate, and plan the replay of recorded action sequences. Their findings indicated that the educational intervention fostered the development of representational competence of the children. Following a slightly different approach, Sprigle and Schafer (1984) studied computer tasks to determine the extent that children's spatial knowledge, memory for the language, and mechanics of programming were related. It was found that only a slight relationship existed between children's predicting ability and their programming ability.

Moreover, the same issue was also studied by Haugland (1992). To investigate whether children's growth in key developmental areas has a link to the kind of software they use, Haugland examined the effect of developmental software and non-developmental software on children's intelligence, self-esteem and creativity. The collected evidence revealed that children exposed to developmental software had significant gains in intelligence, structural knowledge, non-verbal skills, complex manual dexterity, and long-term memory.

Research literature also supplies evidence on whether the use of computer programs can enhance young children's pre-academic skills. In one study, Foster, Erikson, Foster, Brinkman, and Torgenson (1994) examined the instructional effectiveness of a computer program designed to increase phonological awareness of young children. The treatment groups showed significantly greater gain in phonological awareness than the control groups did. With a similar effort, Goodwin, Goodwin, Nansel and Helm (1986) assessed the effects of computer use on preschoolers' knowledge of pre-reading concepts. The software programs used in the study were commercial programs available for this age group. The programs were designed to teach reading readiness concepts. The results indicated no significant treatment effects.

As to whether incorporating computers into preschool classrooms contributes to better academic achievement in young children, Shute and Miksad (1997) found that the use of Computer Assisted Instruction software was successful in increasing language and verbal skills, but not basic math skills. Software with substantial scaffolding features increased general cognitive abilities significantly more than minimally scaffolded instruction. Likewise, Grover (1986) examined whether the use of software programs for preschoolers, designed in accordance with certain cognitive-developmental principles, would result in better learning as compared to software teaching the same content but not incorporating such principles. Grover found that children working with software designed with cognitive-developmental principles had significantly higher percentage correct responses than the control group did.

The research literature seems to show that computer-related technology use plays a positive role in young children's social, psychological, cognitive and academic development. However, for young children the nature of the relationship between playing computer games and academic achievement remains to be further studied. The purpose of the study was to investigate whether kindergarten children who played Sony Play Station computer games learned better than peers who did not.

Method

Participants

The participants in the study were 47 students (24 in Class A, 23 in Class B). They were from two kindergarten classes of an urban public school in the northeastern region. The students were 5 to 6 years old. All of them were from lower socioeconomic families, many from single parent and disadvantaged homes. All of the students were African American. The classes were not different from each other in any significant way; they were not different from their counterparts in other urban schools, according to the teachers of the classes.

The two participating teachers (female) for the two classes (each responsible for teaching one class), had similar preschool education training background. The teacher for the experimental class had taught for 3 years, and the teacher for the control class had taught for 5 years.

Materials

The materials used for treatment included a Sony Play Station, named Lightspan (a computer game device) and over 40 compact discs (CDs) containing games related to the learning content for kindergarten students.

Design and Procedure

A pre-test, post-test with control group design was employed in the study. The two classes were assigned by a flip-coin method to the experimental group (N=24) and control group (N=23). All students in the experimental group received a Lightspan and CDs to keep at home throughout the semester. The experimental group received a lesson from the classroom teacher demonstrating how to operate the Lightspan. The parents of the experimental group also attended a workshop from a Lightspan representative, demonstrating how to operate the Lightspan device.

The Lightspan play activities were then implemented in daily 40-minute sessions, 5 days per week in the experimental classroom. The students played in pairs during the 40-minute sessions in classroom, and at home they were expected to play with their parent (s) for a minimum of 30 minutes every evening. The experimental group engaged in Lightspan activities for 11 weeks.

Except for the daily 40-minute Lightspan play activities in the experimental classroom, the curricula for both classes were identical. The two classes still had their regular daily learning activities throughout the 11 weeks. Other than carrying out their regular teaching plans during the school hours, the two teachers did not do anything special with their students in their respective class during the same period.

Instrument

The Wide Range Achievement Test-R3 (WRAT-R3) was utilized to pre-test and post-test both classes.

Results

To determine which class had more gain, a descriptive analysis was conducted to compare the raw scores of the two classes from the three subtests of the WRAT-R3. The ANCOVA (General Linear Models Procedure) was used to analyze the same data. Main results follow:

1. With the descriptive analysis, the results indicated: Both classes had more gain on the post-test in spelling and reading (decoding skill only), and the experimental group had larger gain; and for both classes, a slight improvement was found on the post-test in math. (See Table 1.)

2. With the ANCOVA analysis, for the Spelling subtest results, the F value for the combined comparison was 28.95, $p < .0001$. When pre-test was used to predict posttest, the F value was 53.73, $p < .0001$; when class was used to predict posttest, the F value was 4.17, $p < .05$. (Type I SS results; same as follow.)

Specific information for the Math and Reading subtest is provided in Table 2.

Discussion

As the results indicate, both classes made slight improvement in math during a 11-week time span. However, the experimental group did not do significantly better in math than the control group. This finding is similar to what Shute and Miksad reported (1996). With regard to this phenomenon, it is postulated that playing Lightspan-related computer games did not help the kindergarten students in math learning not because the Lightspan games are not good, but because these children were not ready in terms of maturity. When children are not ready or not mature enough to learn something, external push can hardly work.

The results also show that the experimental group made significantly more improvement than the control group did in spelling and reading (decoding skill only) areas. However, caution should be exercised as to how to interpret this phenomenon. It seems that playing Lightspan games for these young students may have played a facilitative role in their learning of verbal skills, which are age appropriate tasks for them. To establish a causal relationship for the claim that playing Lightspan leads to better learning calls for further research. Larger samples need to be used in the research to provide convincing evidence.

Conclusion

As the results indicated, the experimental group made significantly more improvement in verbal skills (spelling and decoding) than the control group did. No significantly larger gain was found in math area for the experimental group. However, caution shall be exercised in interpreting these results. More research is needed before a causal relationship (i.e., playing Lightspan games leads to better learning.) can be established.

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Table 1

Mean Scores and Differences for Both Classes

Class	Test Time	Spelling		Math		Reading	
		Mean	Diff*	Mean	Diff	Mean	Diff
A	Pre-test	12.08		8.62		12.63	
	Post-test	14.63	2.54	9.54	.92	15.29	2.67
B	Pre-test	11.61		9.35		13.43	
	Post-test	14	2.39	10.22	.87	14.09	.65

*Diff = Difference (difference between pre- and post-test)

Table 2

ANCOVA Results for Both Classes

Comparison Type	Spelling		Math		Reading	
	F*	p	F	p	F	p
Combined	28.95	.0001	15.65	.0001	30.52	.0001
Pre-test vs. Post-test	53.73	.0001	31.1	.0001	49.21	.0001
Pre-test vs. Class	4.17	.04	.2	.65	11.84	.001

* F = F value

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Signature: Feng S. Din

Printed Name/Position/Title: Feng S. Din

Organization/Address: Dept. of Sp. Ed. William Paterson Univ. Wayne, NJ 07470

Telephone: 973-720-2680

FAX: 973-720-2737

E-Mail Address: dinf@wpunj.edu

Date: 3-1-00