Using Instructional Technology in Transformed Learning Environments: An Evaluation of Project CHILD

Sarah M. Butzin
Institute for School Innovation, Florida

Abstract

This study compared standardized test scores in reading and mathematics for second- and fifth-grade students from two similar technology-rich elementary schools in Miami-Dade County, Florida. One school implemented Project CHILD (Computers Helping Instruction and Learning Development) as its instructional model. The other did not. Project CHILD is a K–5 instructional model that transforms the traditional grade-specific, self-contained elementary classroom into a three-classroom cross-grade cluster. Each classroom in the cluster has at least six learning stations to accommodate varied learning modalities. Students rotate to each classroom in the cluster throughout the day for instruction in reading, writing, and mathematics. Students spend three years working with the same teacher team. Project CHILD students who had completed a full three-year cycle of the program scored higher on all test comparisons. Significant differences were obtained in mathematics applications (Grade 2), reading comprehension (Grade 5), mathematics computation (Grade 5), and mathematics application (Grade 5). (Keywords: computer-assisted mathematics, computer-assisted reading, computer integration, instructional technology, Project CHILD, transformed classrooms.)

REVIEW OF THE LITERATURE

Instructional technology has been the subject of considerable debate. Advocates believe technology can improve learning and better prepare students for the 21st-century workplace. Critics complain that billions of dollars have been spent putting technology into public schools, yet American students continue to rank near the bottom of international test comparisons.

Because instructional technology has a relatively short history in public schools, there is little definitive research to end the debate between the advocates and critics. However, there is a growing body of research that supports computer-based learning.

Most of the early research in the 1970s involved experimental or quasi-experimental studies conducted by university researchers. Small groups of learners using computer-aided instruction were compared with learners using traditional methods. Many of these studies involved the acquisition of specific skills such as word recognition or math facts. Several meta-analyses of these studies have been published over the years, reporting an overall positive effect on learning.

One of the most comprehensive meta-analyses aggregated data from more than 500 individual studies of computer-based instruction. One key conclusion

was that students usually learn more in less time when they receive computer-based instruction (Kulik, 1994). Another review of 176 studies from 1990–1995 conducted for the Software Publishers Association reported that "students in technology-rich environments experienced positive achievement in all major subject areas" (Coley, 1997, p. A30).

Research that focuses on technology-based programs in transformed classroom environments is not as common, although three examples stand out. One of the earliest and most extensive was the study of IBM's *Writing to Read* program, which reported positive results in reading and writing for early learners (Educational Testing Service, 1984). In 1985, Apple Computer Corporation began a 10-year project called Apple Classrooms of Tomorrow (ACOT) to study the effects of technology-rich classrooms on learning. Although test scores did not necessarily improve, positive attitudinal changes were reported (Tierney, 1996). And Pogrow (1990) has published very positive results for low-achieving students using his innovative program called Higher Order Thinking Skills (HOTS).

Project CHILD (Computers Helping Instruction and Learning Development), another comprehensive computer-integration model, was developed in 1988 at Florida State University to create innovative classrooms where technology integration would be the norm (Butzin, 1997). Multiple evaluation studies and longitudinal data consistently have shown that Project CHILD students have higher test scores in reading, language arts, and mathematics than do their counterparts in traditional classrooms (Berquist & Orr, 1991; Butzin & King, 1992; Gill, 1995; Kromhout & Butzin, 1993). Other positive effects, such as reduced discipline problems, better attitudes toward school, more engaged learning, and positive parent involvement, have also been reported. Project CHILD has been validated as an effective program by the Program Effectiveness Panel of the National Diffusion Network (*Educational Programs That Work*, 1994).

DESIGN OF THE STUDY

My study was designed to compare standardized test scores in reading and mathematics for students at two similar technology-rich elementary schools in Miami-Dade County, Florida. Both schools extensively use instructional technology. One school, herein designated as "PC," used their computers within the framework of the Project CHILD instructional model. The other school, herein designated as "non-PC," did not.

The research question asked whether results would differ when computers are used in transformed learning environments as compared to a traditional, self-contained classroom approach. A traditional approach is defined as being teacher-directed with a preponderance of written seatwork along with self-contained, single-year instruction for a specific grade level. The transformed approach is defined as subject-specialty teaming, activity-based learning stations, and multigrade/multiyear instruction.

An underlying assumption is that computers are effective learning tools that can provide motivation, involvement, and feedback, all factors positively associ-

ated with learning. Because a transformed learning environment can better facilitate the integration of technology into the curriculum, it should have a positive effect on learning.

The transformed approach is assumed to have several advantages over the traditional approach. Specialization enables teachers to create multidimensional activities for a particular subject, thus becoming more proficient at integrating instructional software for their one area of expertise. Learning stations enable teachers to shift to more facilitative roles and plan more engaging computer activities for students. Multigrade/multiyear instruction enables teachers to take advantage of the multileveled capabilities of instructional software.

DESCRIPTION OF PROJECT CHILD

Project CHILD is an instructional model for Grades K–5 that uses classroom computers along with hands-on learning stations. Project CHILD is organized around a triangulated cluster design where teams of three teachers work with students across three grade levels for three years. Each Project CHILD classroom contains a computer station with at least three computers, a textbook station for written work, and several exploration stations for hands-on work. There is also a teacher station where teachers can work with individual students as well as small groups.

Three teachers form cross-grade clusters (K–2 or 3–5), with each teacher in the cluster focusing on one of the basic subject areas: reading, writing, or mathematics. Children spend one hour a day in each of the cluster classrooms. The rest of the day they are with one of the teachers whose classroom also serves as their home base. By focusing on one subject area and working with children for three years, Project CHILD teachers are better able to integrate effective software in their area of expertise and allow children to move at their own pace. Project CHILD materials include planning guides with detailed correlations for a wide variety of instructional software in Windows, Macintosh, DOS, and Apple II formats. Through the team approach, children have access to computers every day in one subject or the other. And the learning station approach, along with a structured classroom management system, enables equitable access to computers for all students.

STATEMENT OF PURPOSE

The purpose of this evaluation study was to determine how Project CHILD students finishing their third year in the primary and intermediate clusters compared academically with second- and fifth-grade students in traditional self-contained classrooms. All students had exposure to the same number of computers.

Third-year Project CHILD students were selected for the study to determine whether the continuous progress aspect of Project CHILD had a favorable effect on learning. Second-grade students who had started in kindergarten and fifth-grade students who had started in third grade were identified. Because all students at the PC school participate in Project CHILD, it was an ideal site to isolate a large subgroup of continuous-progress students.

POPULATION

The PC school opened in 1994 in Miami, Florida, bringing together a diverse group of students and teachers from the surrounding communities. The school was founded with a particular interest in promoting cultural diversity in a high-tech environment. The theme for the school was "high tech, soft touch." The new faculty received training in Project CHILD during the summer of 1994 and began schoolwide implementation with the opening of school.

The non-PC school, a neighboring school in Miami-Dade County with similar characteristics, was selected as the comparison school using data provided by the Miami-Dade County Public Schools. Both schools had comparable student bodies and a similar ratio of instructional computers per student, approximately five students per computer (Table 1).

Table 1. 1997–1998 School Year Comparative Demographics

	Total Students	White	Black	Hispanic	Other	Limited English	Free/ Reduced Lunch	Number of Instructional Computers
PC	974	34%	7%	53%	5%	16.9%	27.6%	181
Non-PC	1,201	23%	8%	64%	4%	13.9%	33.4%	243

Both schools can be characterized as "above average," with a majority of students performing better than the 50th percentile as measured by standardized tests (Tables 2 and 3).

Table 2. 1998 Grade Two Median Stanford Achievement Test (SAT-5) Scores in Percentile Rankings

	Reading Comprehension	Math Computation	Math Applications
PC	61	63	52
Non-PC	59	79	57

Table 3. 1998 Grade Five Median Stanford Achievement Test (SAT-5) Scores in Percentile Rankings

	Reading Comprehension	Math Computation	Math Applications
PC	57	74	76
Non-PC	59	70	72

DATA ANALYSIS

The administration at the PC school identified the second- and fifth-grade students who had participated in Project CHILD for the full three-year cycle, 110 second graders and 94 fifth graders.

Test scores for these students were compared to test scores for second- and fifth-grade students at the non-PC school (Tables 4 and 5). There were 188 second graders and 188 fifth graders at the non-PC school.

Table 4. Grade 2 Results

		N	*M*	*SD*
Reading comprehension	PC	109	582.514	43.892
	Non-PC	188	574.505	38.021
Mathematics computation	PC	110	583.545	53.721
	Non-PC	188	582.293	43.862
Mathematics applications	PC	110	578.327	43.047
	Non-PC	188	565.229	37.290

Table 5. Grade 5 Results

		N	*M*	*SD*
Reading comprehension	PC	94	657.596	30.453
	Non-PC	188	647.691	31.114
Mathematics computation	PC	94	674.58	52.080
	Non-PC	188	658.187	34.291
Mathematics applications	PC	94	675.351	45.246
	Non-PC	188	664.809	40.067

Scale scores were used, as they reflect better comparison data than do percentile scores. An independent *t*-test was conducted to determine differences between the three-year PC group and the non-PC group.

Outlier scores in stanine one were discarded to avoid skewing the results. Two outliers in Grade 2 at the PC school were discarded, as were five at the non-PC school. In Grade 5, one outlier at the PC school was discarded, as was one at the non-PC school.

RESULTS

Third-year PC students scored higher on all test comparisons than the non-PC group. Significant differences were obtained in mathematics applications (Grade 2), reading comprehension (Grade 5), mathematics computation (Grade 5), and mathematics application (Grade 5).

DISCUSSION

These results add to the growing body of evidence that Project CHILD has a positive effect on learning, especially when students participate in the program

for a full three-year cycle. The findings also suggest that technology can be more effective when used in a transformed learning environment than when used in a traditional learning environment. However, controlled studies need to be conducted to isolate the effect of technology from the other variables associated with the Project CHILD model.

As the literature suggests, a computer can be a positive learning tool. Now virtually every American elementary school has computers. In the early years, most schools placed their computers in separate labs where access was limited to one or two weekly visits. More recently, the trend is to put computers into classrooms where access will be greater.

However, most teachers still have difficulty integrating computers into classroom instruction. Only 43% of elementary teachers assign computer work frequently (Becker, Ravitz, & Wong, 1999). And inservice training on technology-integration strategies has been notoriously sparse. As a result, teachers tend to use computers as an "extra" for students who finish their written work or who need supplemental practice.

Beyond the limited number of computers and the lack of training, the underlying barrier is that the traditional instructional model is not designed to accommodate computer-enhanced learning. Traditional elementary teachers teach all subjects for a relatively short amount of time (180 school days—and far fewer actual instructional days when non-instructional time is accounted for). Becoming knowledgeable and, especially, keeping current with the wide array of instructional software for all areas of the curriculum is a daunting task for an elementary teacher. And when the computers are competing for the teacher's attention in a lecture/seatwork instructional model, the teacher prevails.

The Project CHILD model is designed to overcome these barriers. The CHILD model teams teachers in subject specialties so they can focus on one area and become proficient in effectively using instructional software. Planning guides, which correlate a wide variety of instructional software with academic skills and benchmarks, along with extensive training and coaching, enable teachers to integrate software into their daily lesson plans. Project CHILD also offers a systematic classroom management system so that access to computers is equitable and frequent, even when limited numbers of computers are available. Working with students for three years increases the amount of instructional time. And in a classroom designed with multiple learning stations, the computer is not the teacher's competitor but rather the teacher's valued assistant.

The positive results for Project CHILD students tend to support the notion that the debate over educational technology should not focus on how many computers are in classrooms, but rather how they are used. As the public questions the need for funding more technology in our public schools, it is important to look at the underlying instructional model. Simply putting more computers into a model ill-designed to accommodate technology integration will continue to disappoint. We need to turn more attention to transforming the traditional classroom to an environment more conducive to active learning. Project CHILD is one transformed classroom model that seems to work. ■

Contributor

Sarah M. (Sally) Butzin is executive director of the Institute for School Innovation in Tallahassee, Florida. She is the developer of the Project CHILD program. Information about the institute and its programs is available at www.ifsi.org or by calling 800.940.6985. (Address: Sally Butzin, Institute for School Innovation,1355 E. Tennessee St., Tallahassee, FL 32308; sbutzin@ifsi.org.)

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