The Effects of “Classworks” in the Classroom

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Abstract

The purpose of the study was to examine the effects of computer-assisted instruction (CAI) in the classroom. Specifically the impact of “Classworks”, a computer-assisted instructional program, effect on student achievement. The study also examined teachers’ attitude toward using “Classworks” with their students. The quasi-experimental study involved 30 third grade students and two teachers over a 14 week period at a selected elementary school in Texas. The students who participated in the experimental group increased their posttest mean 9.06 percentile points more than the control group’s mean. This study has shown that “Classworks” increased student achievement in math and impacted teachers’ attitude toward CAI.

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The Effects of “Classworks” in the Classroom

The need for improvement of student achievement has been the focus in education for years. Many plans have been developed to increase student achievement. For example, legislators, administrators, and educational experts have improved school environment, curriculum, instruction methods, and strengthened teacher standards in hopes of improving students’ academic level.

According to Lowe (2001), the computer was widely introduced to the educational setting in the 1980’s. This new technology in the classrooms was going to be the cure for all educational problems. Schools have since spent billions of dollars installing, maintaining, and upgrading computer technology with the goal of increasing student achievement.

Efforts by federal and state governments, along with institutions of learning, are being made to introduce and integrate computers into school. An estimated 4.4 million computers are now currently installed in America’s classrooms. The ratio of students to computers has dropped from 125 students per computer in 1984 to the current ratio of 10 students per computer (Coley, Cradler, & Engel, 1997).

During the 1990’s, schools increasingly relied on computers for instructional purposes. Computer-assisted instruction (CAI) improved students’ academic achievement by exposing learners to a variety of instructive and interactive learning-based lessons (Tzuriel & Shamil, 2002). CAI provides students with immediate feedback, ongoing guidance, and instruction allowing students to access instant research information along with current information.

CAI involves students, teachers, and administrators in the ever growing process of making schools exciting and challenging places to work and to learn. Students are thus involved in thought-provoking activities that connect academic learning with practical, real world projects (Middleton & Murray, 1999). CAI learning prepares students for productive work, learning and responsible citizenship in the 21^{st} century (Sherry, Billig, Jesse, & Watson-Acosta, 2001).

The Meridian Independent School District, a small rural school in central Texas, has spent over a million dollars of grant and local funds over the past decade toward computer technology. Meridian Elementary recently dedicated funds to replace their outdated network software. The elementary goals were to address objectives set by the 2003-2004 Meridian Elementary Campus Improvement Plan. Three strategies to be met were: 1) technical training assistance for teachers 2) increase and integrate classroom technology 3) attain 90% or above for all students in the area of the Texas Assessment of Knowledge and Skills (TAKS) Math test.

A technology committee was formed which spent months researching and sampling computer-assisted instructional software to be installed for the campus. In January of 2004, the Meridian School Board accepted the recommendation of the committee to purchase “Classworks” designed by Curriculum Advantage. The school’s objective was to integrate technology into the curriculum, promote computer literacy for its students, and improve student achievement through the process.

Review of Literature

After providing a foundation of the definition of computer-assisted instruction, this review of literature will examine its impact on student achievement and teacher attitudes toward CAI.

CAI was developed for students to examine a class subject in more detail. CAI is designed to serve as an expansion of subjects discussed in class and allows students more time to use and validate the knowledge taught (Cooper, 1998). With the appropriate software, the computer has the ability to teach students interactively (Brown, 2000).

According to Curriculum Advantage's research consultant, D. Nicholas (personal communication, April 26, 2004), there are two types of CAI; stand-alone products and integrated learning systems. Stand-alone products offer a variety of activities from skill and practice software to content-based tutorials. However, full benefits are lost by a lack of a built-in management system that monitors and reports a student's progress and performance.

Integrated learning systems (ILS) provide curriculum within a carefully designed management system. ILS can provide instruction, usually in the basic skill areas of reading and math, at different grades levels. It maintains records of student progress on networked computer systems. The system can also use adaptive strategies to adjust the activities that are made available to the student, deciding not only what kind of remediation or enrichment is appropriate, but also when to deliver it (Kulik, 2002; D. Nicholas, personal communication, April 26, 2004).

Student achievement

Four meta-analyses studies (Bayraktar, 2001; Blok, Oostdam, Otter, & Overmaat, 2002; Christmann & Badgett, 2003; Kulik & Kulik, 1999)found CAI positively affected student achievement. For example, Kulik and Kulik's (1991) meta-analysis examined 254 controlled evaluation studies. They found 81% of students who participated in the CAI setting had higher examination scores than students who did not participate. The average effect size was 0.30 standard deviations in performance higher for CAI students than for students in the control group. The effect size was defined as "the difference between the mean scores of the two groups divided by the standard deviation of the control group" (p.78). The results showed a significant increase of student achievement.

Christmann and Badgett's (2003) meta-analysis examined 68 studies involving the effectiveness of CAI with elementary students. They found students who received CAI attained higher academic achievement than did 63% of those students who received only traditional instruction.

Another meta-analysis (Blok, Oostdam, Otter, & Overmaat, 2002) examined the effectiveness of 42 studies of CAI programs with beginning reading instruction. The results showed that CAI had a small, but positive effect on beginning readers. Bayraktar's (2001) meta-analysis investigated the effects of CAI on student achievement with science education. The study found that the typical student moved from the 50th percentile to the 62nd percentile in science when CAI was used.

Individual studies (Boling, Martin, & Martin 2002; Brown, 2000; Middleton & Murray 1999; Traynor, 2003; Wilson, Majsterek, & Simmons,1996) support the findings of the meta-analyses that CAI increased student achievement. For example, Boling, Martin, & Martin (2002) found that CAI had a substantial impact on student achievement. Their results suggested the use of CAI served as a motivating medium that enhanced good instruction. They concluded by recommending moving students from traditional dependent instruction toward independent learning facilitated by differing uses of technology in the classroom.

One commonly used math-based CAI program is “Accelerated Math” (AM). AM is an enhancement to regular mathematics instruction in general education classes that consistently demonstrated significantly higher math achievement gains than students in the same math programs who did not receive the AM enhancement. The implementation of AM led to students’ spending more time on classroom activities identified as contributing to positive academic outcomes (Ysseldyke, Spicuzza, Kosciolek, & Boys, 2003; Ysseldyke & Tardrew, 2002).

Spicuzza and Ysseldyke (1999) researched and studied the effects of AM on student math performance during a six-week summer school program in an urban school. Results indicated students using AM showed an average gain of 5.75 Normal Curve Equivalents (NCE) units on the Northwest Achievement Levels Test, a district math achievement test.

Ysseldyke and Tardrew (2002) conducted a large nationwide experiment that examined the extent to which the use of AM enhanced achievement outcomes for students in Grades 3-10 in 67 classrooms in 47 schools in 24 states. The elementary students using AM had an NCE gain difference of 10.75 over the students that did not receive AM.

The benefits of using CAI include the need to learn technology, the movement of students from knowledge and comprehension into application and analysis, and the development of student computer literacy by applying various computer skills as part of the learning process (Dockstander, 1999). CAI also has a profound affect on students' attitudes toward their classes and their computer use (Kulik & Kulik, 1991).

Teacher attitude

Despite the calls for the inclusion of technology in instruction and the evidence that technology enhances students' learning, technology tools are not widely used in K-12 classrooms. In fact, research indicated that many teachers are not using technology tools for teaching (Huang & Waxman, 1996; Manoucherhi, 1999). For example, Manoucherhri (1999) found that teachers have limited views regarding the use of technology and that approximately 20% of teachers reported that technology has no relevance to their curriculum.

Most teachers have difficulty integrating computers into classroom instruction. Only 43% of elementary teachers assign computer work frequently. As a result, teachers tend to use computers as an "extra" for students who finish their written work or who need supplemental practice (Becker, Ravitz, & Wong, 1999).

One possible explanation for the lack of CAI in classrooms is the limited number of computers and a lack of training. These underlying barriers that the traditional instructional model was not designed to accommodate computer-enhance learning. Traditional elementary teachers teach all subjects for a relatively short amount of time. Becoming knowledgeable and keeping current with the wide array of instructional software for all areas of the curriculum is a daunting task for an elementary teacher. When the computers are competing for the teacher's attention in a lecture/seatwork instructional model, the teacher prevails (Iding, Crosby, & Speitel, 2002; Vannatta & Fordham, 2004)

Statement of the Problem

In efforts to improve student achievement, schools are merging computer-assisted instruction into their curricula. More research is needed to validate the spending of funds toward implementing CAI. The results of this study will provide vital information for administrators when deciding the future of CAI for their districts.

Purpose of Study

The purpose of this study was to determine the impact of "Classworks", a computer-assisted instructional program, on student achievement. The study also examined teachers' attitude toward using "Classworks" with their students.

Research Questions

1) Does “Classworks” impact student achievement for third grade mathematics students at a selected elementary school in Texas?

2) Does “Classworks” impact teachers’ attitude toward computer-assisted instruction at a selected elementary school in Texas?

Definition of Terms

1) “Classworks”- For the purpose of this study, “Classworks” was a comprehensive computer learning system developed by Curriculum Advantage. It contained over 1,650 units of instruction, drawn from 190 software titles in Language Arts and Mathematics (Classworks Reference Manual, 2003).

2) Mathematics curriculum- For the purpose of this study, mathematics curriculum followed Saxon’s Math 3 (Larson, 2001).

3) Pretest and posttest- For the purpose of this study, the pretest and posttest was the Stanford Achievement Test, Ninth Edition (SAT 9). SAT 9 was developed by Harcourt Assessment, Incorporated and is a computerized multiple-choice assessment that was included in the “Classworks” program. Only the math portion was taken in this study.

4) Student achievement- For the purpose of this study, student achievement was the degree of growth of percentiles from the pretest to the posttest on the SAT 9.

4) Teacher attitude- For the purpose of this study, teacher attitude toward CAI was measured using a questionnaire.

5) An elementary school- For the purpose of this study, an elementary school consisted of grades kindergarten through six.

Limitation

The limitation of this study was the time period of 14 weeks.

Methodology

Participants

The participants in this study included 30 third grade students at a selected elementary school. Of the 30 students, 57%(N=17) were Anglo, 37%(N=11) were Hispanic, and 6%(N=2) were African-American. Furthermore, 60%(N=18) of the students were females and 40%(N=12) were males. Fifty seven percent (N=17) of the participants were identified as economically disadvantaged, 23%(N=8) were in the Gifted and Talented program, and 23%(N=8) are in the English as Second Language program.

The participants in the teacher attitude questionnaire consisted of two Anglo females teaching third grade.

Procedure

Of the total population, 15 (50%) students were assigned to a control group and received the traditional Saxon mathematics instruction. The remaining 15 (50%) students received the traditional Saxon mathematics instruction with the addition of "Classworks" one hour per week.

The participants were randomly placed in classes at the beginning of the school year. The pretest was given the first week of the school year in August. Both groups received the same traditional instruction following the Saxon mathematics curriculum and sequence. In addition, the experimental group used only the mathematic portion of “Classworks” in the computer lab for one hour per week. The experimental group used “Classworks” for 14 weeks. To keep the study ethical, the control group used the language arts portion of “Classworks”.

At the conclusion of 14 weeks, all participants retook the pretest to serve as the posttest. The standardized mean difference of percentiles was calculated to determine growth in student achievement.

In order to determine teacher attitude, the researcher created and designed a survey questionnaire. This three, unstructured item question survey was administered to two teachers at the selected elementary school who used “Classworks” for the first semester. The questions involved the performance of “Classworks”. The information determined the teachers’ attitude toward using “Classworks” with their students.

Data Analysis

The Statistical Package for Social Science (SPSS), version 11.5 was employed to determine the results of the study. Results for research question one were found by computing the percentile point increase or decrease for each student between the mathematic pretest and posttest. The percentile point increase was found for both the experimental group and control group. An independent t-test comparing the mean scores of the pretest and posttest between the experimental group and control group to determine if a significant difference exsisted.

The Pearson product moment correlation was computed to determine the magnitude of the relationship between the pretest and posttest. This Pearson product moment correlation was also used to determine the degree of relationship between scores to students' gender, ethnicity, social economic status (SES), and class (experimental/control).

The results for research question two were qualitative. The survey examined teacher attitude toward "Classworks". The two teachers involved in the study completed a post experimental survey questionnaire. The questionnaire, developed by the researcher, consisted of 3 questions.

Results

The purpose of the study was to 1) investigate the impact of "Classworks" on student achievement for third grade mathematics students at a selected elementary school in Texas and to 2) determine the impact of "Classworks" on teachers' attitude toward computer-assisted instruction at a selected elementary school in Texas.

Research Question #1

Does "Classworks" impact student achievement for third grade mathematics students at a selected elementary school in Texas? Descriptive statistics were computed for all students' pretest and posttest. The means and standard deviations (SD) for the pretest and posttest are reported in Table 1. The overall mean for the students' pretest was 35.83 (SD=9.649) with scores ranging from 15 to 59. The overall mean for the students' posttest was 47.43 (SD=11.643) with scores ranging from 24 to

67. Table 1 indicates that an overall increase of student achievement was made by the whole population participating in the study.

Table 1

Descriptive Statistics for Pretest and Posttest

Test	N	Minimum	Maximum	Mean	SD
Pretest	30	15	59	35.83	9.649
Posttest	30	24	67	47.43	11.643

A paired sample t-test was computed to determine the paired differences between the pretest and posttest. Table 2 shows the mean of the paired differences was -11.60 (SD=8.846). The difference showed a t value of -7.183 with a p value of <01. The data results show there was a statically significance difference between the pretest and the posttest.

Table 2

Paired Samples test for Pretest and Posttest

		Mean Difference	SD	t	Sig.(2-tailed)
Pair 1	Pretest-Posttest	-11.600	8.846	-7.183	.000

A Pearson product moment correlation was used to determine if there was a relationship between the overall group's pretest and posttest. This Pearson product moment correlation was also used to determine the degree of relationship between scores to students' gender, ethnicity, social economic status, and class. The results are presented in Table 3. The Pearson product moment correlation showed that there was a strong relationship (r=.669) between the pretest and the posttest, which was significant at the .01 level. A strong relationship (r=.706) between social economic status and ethnicity was found, which was significant at the .01 level.

The most important information that Table 3 reveals, is the relationship of the posttest scores between the experimental and control class. The correlation of -.381 was found and is significant at the .05 level.

Table 3

Correlations between Pretest, Posttest, and Students

Variables	Pretest	Posttest	Gender	Ethnicity	SES	Class
Pretest	1.00					
Posttest	.669**	1.00				
Gender	-.265	-.177	1.00			
Ethnicity	-.145	-.233	-.110	1.00		
SES	-.235	-.355	-.027	.706**	1.00	
Class	.018	-.381*	.000	-.162	.067	1.00

**Correlation is significant at the 0.01 level (2-tailed)
*Correlation is significant at the 0.05 level (2-tailed)

An independent t-test was used to determine the difference between means of the pretest and posttest of the experimental group verses that of the control group. Table 4 shows that the experimental group had a pretest mean of 35.67 (SD=8.966) and a posttest mean of 51.80 (SD=12.399). The control group had a pretest mean of 36.00 (SD=10.603) and a posttest mean of 43.07 (SD=9.285).

The experimental group had a 16.13 increase from pretest to posttest. The control group had a 7.07 increase from pretest to posttest. There was a 9.06 difference between the increases of the experimental over the control group. Table 4 reveals that the experimental group, which used "Classworks", had a statistically significant increase of student achievement compared to the control group.

Table 4

Mean Differences between the Experimental and Control Group

Class	N	Pretest Mean	SD	Posttest Mean	SD	Mean Differ.	t	Sig. (2-tail)
Experimental	15	35.67	8.966	51.80	12.399	16.13	-7.485	.000
Control	15	36.00	9.285	43.07	9.285	7.07	-3.936	.001

Research Question #2

Does "Classworks" impact teachers' attitude toward computer-assisted instruction at a selected elementary school in Texas? The two teachers involved in the study completed a post experimental survey questionnaire. The unstructured item questionnaire, developed by the researcher, consisted of 3 questions.

The teachers' responses were positive in regards to the question concerning the advantages of using "Classworks". One teacher thought "Classworks" provided reinforcement of skills and concepts taught in the classroom setting and provided students with extra practice time outside of the scheduled math instructional period. The same teacher stated that "Classworks" helped with the remediation of math concepts. The reports generated by “Classworks” were helpful and used as a diagnostic tool for analyzing the students’ strengthens and weaknesses.

The other teacher expressed that one of the advantages of “Classworks” was the ability to practice math and reinforce keyboarding skills at the same time. She also stated that the flexibility of “Classworks” allowed her to individualize each student’s curriculum and goals.

The second question on the survey asked teachers the disadvantages of using “Classworks”. Both teachers thought “Classworks” should be used as a supplement to previous teacher instruction. They were concerned teachers would rely on “Classworks” to replace teacher instruction in the classroom. Both felt concepts should be first taught by the regular classroom teacher and then students should be exposed to the concept using “Classworks”.

The third question asked teachers their feelings about the amount of time “Classworks” took in their instructional schedule. One teacher responded there was not enough time devoted to using “Classworks”. The other teacher stated that every minute using “Classworks” was valuable. She stated “Classworks” gave each student individualized instruction thus giving her time to conference and/or observe individual students.

The overall attitude of the teachers involved in the "Classworks" study was positive. They felt "Classworks" was one the best computer-assisted instruction products available for educational use. They stressed, however, that while "Classworks" was a great CAI product, it was no substitute for teacher instruction.

Discussion

The purpose of this study was to examine the impact of "Classworks", a computer-assisted instructional program, on student achievement. The researcher in this study wanted to determine if third graders in a selected Texas elementary school were able to increase student achievement using "Classworks" versus third grade students not using "Classworks". Along with this question, the question of teacher attitude toward computer-assisted instruction was addressed.

The results of this study were consistent with previous studies noted in the review of literature. The students who participated in the experimental group increased their posttest mean 9.06 percentile points more than the control group's mean. This suggests that CAI had a significant impact on student achievement.

While the results were extremely powerful, there are some issues to consider when interpreting them. The sample size of both groups were small, thus it is difficult to determine whether or not the results accurately represent a larger population. Another issue would be the short period of time in which the project was studied. The 14 week study may have shown different results if conducted over a longer period of time.

There were several factors that may have contributed to the positive results of this study. The students having extra mathematic practice on the computer was a key component resulting in student achievement. When students are reinforced with additional CAI instruction time, the probability of concept and objective comprehension and retention will be increased for the students.

"Classworks" provided an alternative instructional method that impacted student performance. An instructional objective or concept was presented in a variety of formats with continual reinforcement. Classroom instruction is usually presented from one viewpoint based on curriculum standards. Students spent more time on task with "Classworks" because they enjoyed the variety of instruction and technology.

One benefit the researcher discovered in "Classworks" was an accessible form of monitoring student progress toward the completion of instructional objectives. The student automatically moved on to the next objective after they demonstrate mastery of the previous one. Without "Classworks" it is difficult to see whether teachers monitored the progress of student growth over curriculum objectives. “Classworks” automates part of the process of evaluating progress toward mastery of the classroom curriculum objectives.

Based on the data presented in the study the researcher has two recommendations. The first recommendation would allow more computer time with “Classworks”. Students need to increase CAI time from one hour per week to two hours. Increasing student CAI use would facilitate and increase the growth of student achievement.

The second recommendation would allocate more time for teacher inservice to facilitate understanding of “Classworks”. Teachers were given an eight hour introduction prior to the study. Teachers did not have the expertise to manipulate the curriculum scope and sequence of “Classworks” to coincide with the classroom curriculum. Additional inservice time would allow teachers to become accustomed to the dynamics and structure of “Classworks” and utilize it to the fullest potential for student achievement.

Future studies need to be conducted to strengthen the claim that CAI has a positive impact on student achievement. The researcher suggests that the scope and sequence of the classroom curriculum align with objectives presented in “Classworks”. At times during the use of “Classworks”, teachers would have to teach new objectives that previously were not introduced in the classroom. Matching the scope and sequence of the two curriculums would maximize student achievement and lessen teacher frustration.

Based on the results of this study, teachers and administrators need to be aware of the positive benefits that CAI can provide. Teachers would have a better attitude if researched and successful CAI programs were mandated and scheduled by administrators.

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