Evaluation Series

Preliminary Study, PLATO® Elementary Math Software, Fairview Elementary, Dayton, Ohio

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Executive Summary

Program Description.

The report describes the use of PLATO® elementary software in Fairview Elementary School, Dayton, Ohio. PLATO software was used in Title I math classes for the last three school years.

The Title I teacher in the study used PLATO software as an integral part of her class instructional strategy. She started each day's lesson with a fifteen-minute group overview of the topics and skills to be learned. Then the more able students worked individually on the ten computers in the classroom while she provided the other half of the students small-group and individual instruction. After 30 minutes the students switched places.

Math achievement data were analyzed for 88 students enrolled in the Title I class over the three school years. Pre- and post-test math scores were obtained for the Ohio State Performance test in mathematics and for parallel math practice tests.

Student Achievement.

Four percent of the Title I students scored at the proficient level on the fourth grade math pre-test. By the end of the year twenty-four percent of the students were proficient in math. This represents moderately large and educationally meaningful gain in performance. It is interesting to note that the average school fourth grade math proficiency for Fairview elementary was twelve percent; the Dayton City School District average was fourteen percent proficient. Further, students at the lower and higher ends of math ability gained at about the same rate from the pre- to post-test.

Other Lessons.

PLATO software worked very reliably over the three-year period. There were few system-related problems and they were resolved quickly by technical support.

The teacher was very satisfied with the content and instructional strategies in the system.

PLATO software enabled greater individualization teacher instruction for one group of students as the other students engaged in math instruction on the system.

Consider adding problem solving to each strand in the PLATO® math curriculum.

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Preliminary Study, PLATO® Elementary Math Software, Fairview Elementary, Dayton, Ohio

Introduction

Fairview Elementary provides a Title I mathematics class for qualifying students who need academic assistance in this topic. Over the last three years the Title I math class at Fairview has been using PLATO software to help teach these students. This report provides a description of their experience and an initial assessment of the system in use.

Data from the Title I math class will be examined for the school years 1998-1999, 1999-2000 and 2000-2001. A total of 88 students, primarily in the fourth grade, but also in the third and fifth grades, were served in these years. This report presents the teacher's report of how she used PLATO software. Her comments on the system's value and her suggestions for improvement are also presented.

The report also examines how well the Title I students performed on the Ohio Performance test in mathematics and on parallel practice tests. Fourth grade students are considered proficient in mathematics if they achieve a score of 218 or higher when tested near the end of their fourth grade year.

Fairview has consistently scored below the state averages on the annual Ohio Proficiency math test. For the 1999-2000 school year 12.2% of Fairview's fourth graders scored as being proficient in math. The Dayton City School District fourth grade average was 13.9%; the Ohio state fourth grade average was 48.9%.

Program Description

The School. Fairview Elementary is one of fifty schools in the Dayton City School District. Fairview is located in a mid-size central city with an enrolment of 414 students (1999-2000 school year). The school provides classes in Kindergarten through the 6th grade with an average ratio of 15.2 students per teacher. According to the school's annual report card, the yearly spending per pupil has increased over last three years to $6,963 in 2000-2001; the state average expenditure per pupil was $6,017.

Fairview has adopted a science theme to emphasize in their curriculum. They have organized student clubs devoted to science, computers, and math. They also offer an extended day program for students. The school requires uniforms for students: dark blue pants and skirts, light blue or white shirts and blouses. Fairview follows a year-round school calendar. The twelve-month period from July to June the next year is divided into four quarters. Students are scheduled to attend for three of the quarters. Between each quarter are intersession days for preparation, teacher breaks, and the potential of extra instructional time for students.

A little over half of Fairview's students (55%) are eligible for the Federal free or reduced price lunch program. Fairview's students are primarily Black (84%) with a minority of White (15%) and a few Hispanic and Asian students (1%). The school's overall attendance rate for 1999-200 was 91%, which is about average for an Ohio elementary school.

The Students. The Title I students considered in this report used PLATO software in one of three school years from 1998 to 2001. About half of the students were fourth graders when studied. Smaller portions were in third or fifth grade, or the records available for this study only indicated they were in the third to fifth grade range. Boys and girls were equally represented in the classes. The ethnicity of students roughly mirrored the school's ethnic composition. Table 1 provides descriptive statistics about the students.

Table 1. Title I Student Demographics

Variable	Frequency	Percent
School year		
1998-99	46	52.3%
1999-00	18	20.5%
2000-01	24	27.3%
Total	88	100.0%
Grade Level of Student		
3rd	15	17.0%
4th	44	50.0%
5th	16	18.2%
3 to 5	13	14.8%
Total	88	100.0%
Student Gender		
Boy	43	48.9%
Girl	45	51.1%
Total	88	100.0%
Student Ethnicity		
Black	82	93.2%
White	6	6.8%
Total	88	100.0%

Teacher Description of PLATO® Software Use

A telephone interview was conducted in August 2001 with Mary Clark, the Title I math teacher at Fairview Elementary. She answered a number of questions to describe her use of PLATO software over the last four years. The purpose for the interview was to have her describe her use of the system and to identify ways it might be improved. Following is an edited summary of the questions and answers from the interview.

How long have you been using PLATO software?

I have been using the current system for 4 years in my classes. This system is a key part of my instructional tools.

For what part of the school year did your learners have access to the PLATO system?

My students had access to PLATO software all year long as a regular part of their class instruction. In the past several years the Title I classes at Fairview elementary have used the PLATO system, but not the regular classes. This school year (2001-2002) the PLATO system will be installed and used throughout the building in regular education classes. This is because of high teacher belief in the effectiveness of the system based on their observations of what it has done for the Title I students.

Was there a regular time within the sequence of a lesson or unit in which students worked on PLATO software? "What do you typically do while the learners are working on PLATO software?"

The Title I program at our school is a pullout program. I had my classes from one to one-and-one-half hours per day. Sometimes they also came in during lunch, intersession periods, or during extended learning times. I typically had 18 to 22 students in a class per year. I usually divided my students into two or three ability groups for instruction.

The way I use the PLATO system is as part of a teacher-directed instructional strategy. I begin each class period by checking homework and providing a 10 to 15 minute introduction to the topic and skills for the day. After the introduction I direct the more advanced students to go and work on assigned activities on the PLATO system. The other students stay with me as I provide additional small-group and individual help. After 30 minutes or so I have the students switch between teacher instruction and computer use. Some classes I do not have them switch if the less advanced group needs more intense help from me.

For the last three school years I have had 10 workstations in my classroom with the PLATO software. The PLATO system is used to provide independent practice and reinforcement for the topics being learned. I use the technology for reinforcement, assessment, supplementing class instruction, and extending the topics studied. Students would average between 3 to 5 hours per week on the PLATO system. This included class time, extended learning times, and lunch use.

Describe any strategies you employed to determine whether or not the PLATO modules assigned to each student were the most appropriate for ensuring their success in your class.

Students were ability grouped by assessment measures in the PLATO system along with information from the Ohio Proficiency practice test and my own assessment of their ability. This was done by teacher judgment and experience.

"Did the learners use PLATO software alone, in pairs, in groups of 4 or fewer, or in a large-class grouping?"

Almost always the students worked alone as independent learners. Only about five percent of the time did students worked together in pairs.

Do you monitor individual learner progress? If so, how?

I monitor their work in class as we interact. I also use the PLATO assessment reports. Students are considered to have mastered a PLATO unit assigned to them only after I check their progress; they cannot "test out" of a unit without my clearing it.

What percentage of the time was the computer system for PLATO software fully functioning for your class?

Generally the computer system worked without problems. One year the computer system was down for three months while we waited for the district to replace the file server. However, this was not a problem with the PLATO system. There were few system-related problems and they were resolved quickly by PLATO® technical support.

How would you change the PLATO lessons? What other comments or suggestions do you have on the PLATO system?

I am very satisfied with the content of lessons and instructional strategies used.

I do, however, recommend that the PLATO elementary curriculum use projects more. Our district has published problem solving learning standards and it would be helpful to add problem solving to each PLATO strand. Math Expedition is a good example of what might be done.

What suggestions do you have to improve the way you use the PLATO system?

I'm going to stick with what I am doing now; it works fine for me.

Student Outcome Data

Math Achievement Gains. Student records were provided for Title I math students for the last three school years. These records included student demographic information (gender, grade level, and ethnicity) as well as math performance test scores for the year prior to the Title I class (usually a practice performance measure) and at the end of the class (the fourth grade Ohio math performance test). Students were included in this analysis only if they had both pre- and post- math performance tests. A few student records did not clearly indicate student grade level, but they were retained for the analysis.

When the student data was received from Fairview Elementary it was noted that student records came from different school years, students in different grade levels, and that students differed in entry ability and other characteristics. The question was asked whether students should be combined into one group for analysis or should they be analyzed as separate groups? A preliminary analysis was done to see if different potential subgroups of students actually had different scoring patterns on the Performance tests. This analysis showed that there were no statistically significant differences on pre- or post math performance measures for any of the following subgroups: grade level, student gender, student ethnicity, and year enrolled in the Title I class. Based upon this finding we combined the records into one group of 88 students for the analysis reported below.

The average math proficiency pre-test score was 190.8; the range of pre-test scores went from 125 to 227. Based on this score less than five percent of the Title I students start off being proficient in fourth grade mathematics. The average score on the post-test for this same group was 201.2; the range of post-test scores went from 148 to 247.

Effect Size. Eighty-one percent of the students had higher post-test scores. On the post-test nearly twenty-four percent of the students scored as proficient. The pre- to post-test difference of 10.4 points meant that nearly twenty percent more students achieve a proficient level on the state math test. Considering that the overall school average on this test was just over twelve percent of fourth graders being proficient, this is a very interesting finding.

Subtracting the pre-test score from the posttest score yields an average gain of 10.4 points. One common way of judging how meaningful such a gain score might be is to use the average standard deviation of the pre- and post-scores as a measuring stick. Doing this we find that the gain of 10.4 points is a little more than one-half standard deviation in size (the average of the two standard deviations is 19.4). This is a statistically significant increase in math scores. This magnitude of difference is usually considered moderate in size but still educationally meaningful.

The test-retest correlation between the pre- and post-test scores was, as would be expected, strongly positive (r = .808). An examination of a scatterplot for the pre- and post-test scores showed a strongly linear pattern. This indicates that gains were

experienced equally for students both at the higher and lower end of the achievement range. Students at the lower ability levels increased about as many points as students on the higher end of the pre-test scores. Table 2 provides descriptive statistics for the pre- and post- math scores. Figures 1 and 2 show the mean pre- and post-test math scores and the percent of students achieving a proficient score of 218 or higher. Figure 3 shows the scatterplot of pre- and post-test scores.

Table 2. Math Proficiency Scores

Math Proficiency Score	Percent Proficient	Mean Score	Std. Deviation	Test Statistic
Pre-Test	4.5%	190.8	17.8	$r = .818, p < .001$
Post-Test	23.9%	201.2	21.0	
Post-Pre Difference	19.4%	10.4	12.1	$t(87) = 8.03, p < .001$

n=88

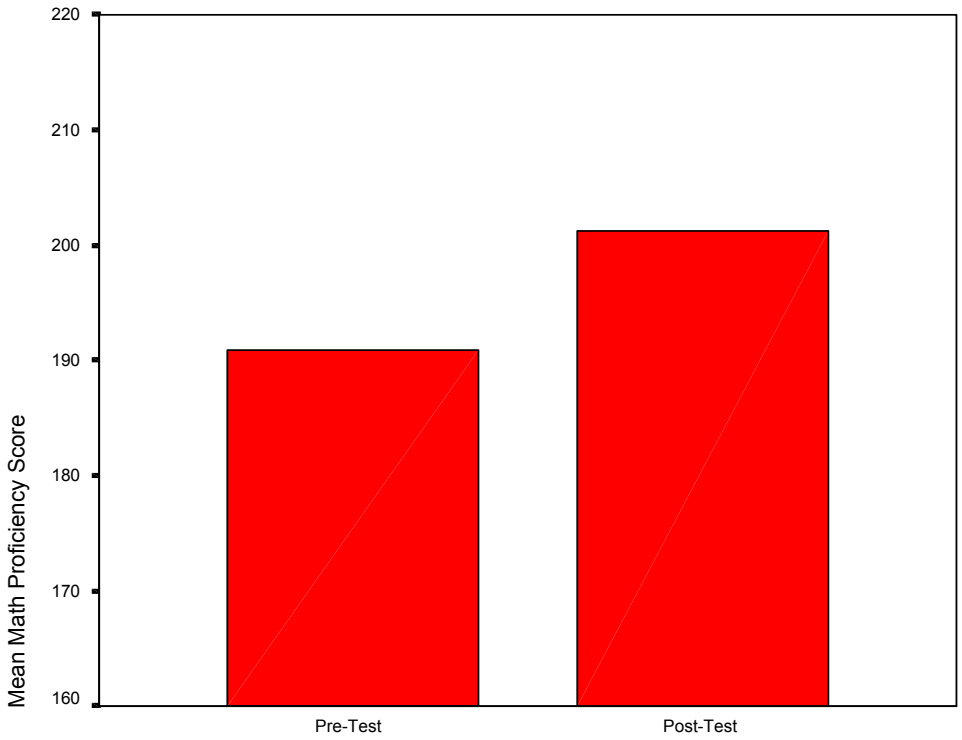

Figure 1. Mean Percent Correct on Math Pre- and Post-Tests

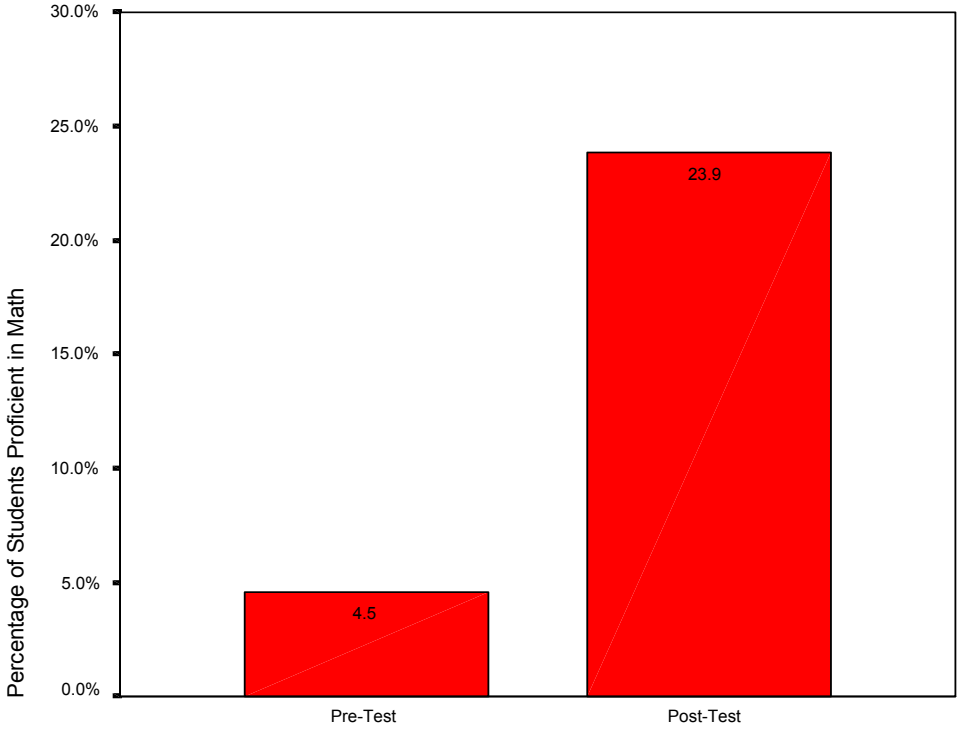

Figure 2. Percent of Students Achieving "Proficient" Level on Math Test

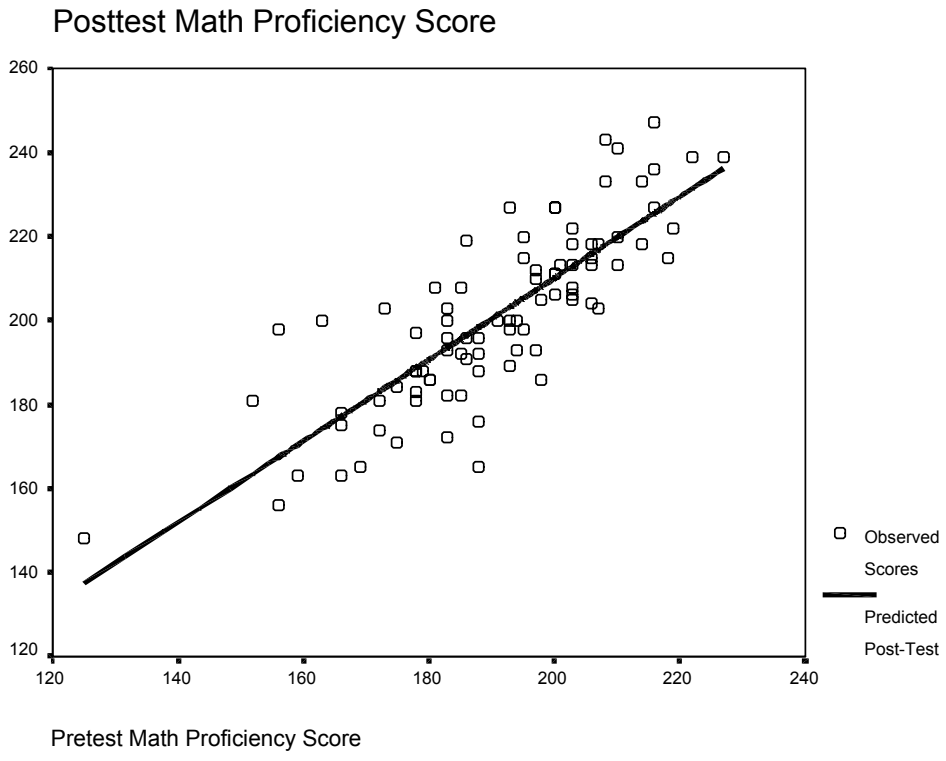

Figure 3. Scatterplot of Pre- and Post-Test Math Proficiency Scores

Initial Conclusions

The purpose for this report was to provide a description of how the PLATO® Learning System was used in one setting and to provide an initial assessment of the system. Even though this report provides only preliminary information about the PLATO system, the findings here seem to suggest several initial conclusions.

It appears that this was a successful implementation of the PLATO system over a three-year period. The system is well received by teachers as evidenced by the school now expanding the implementation of the PLATO system into regular classrooms.

The Title I teacher was able to use the PLATO system as an integral component in her classroom instruction and curriculum. She was able to assign students to modules and manage their use of the system within a larger set of instructional activities.

This use of the PLATO system provided the opportunity to provide greater individualization for those students who most needed the teacher's attention. Having the more able students engaged in meaningful math instruction on the system freed the teacher to spend more individual time with those students who most needed help. It also provided practice and reinforcement for all students to extend their understanding of the group instruction on mathematics.

Students enrolled in the Title I class generally experienced meaningful growth in math proficiency scores. Eighty-one percent of the students increased from their pre- to post-test scores. The gains in student math proficiency meant that at the end of the class nearly twenty-four percent of the students scored as being proficient in fourth grade mathematics. This ending proficiency score was substantially higher than the school or district averages.

Both lower and higher ability levels of students seemed to benefit equally from the class instruction and use of the PLATO system.

It is important to remember these are initial observations about the PLATO system. Additional studies need to be done covering more curriculum areas than just mathematics. Studies need to examine program use in multiple classrooms across multiple schools. There is a need to examine how the system is used as part of a wider range of instructional strategies and with both regular students as well as Title I students. Finally, future studies need to include individual student system use information.

About the Authors

David W. Quinn is currently working as an independent evaluator specializing in evaluating technology use for learning and teaching. He is particularly interested in supporting beginning literacy instruction with technology. He received a doctorate in educational evaluation from Western Michigan University in 1978 and a Masters in Instructional Science from Brigham Young University in 1975. Dr. Quinn had conducted numerous evaluation studies for clients in K-12, university, not-for-profit social services, and for-profit training companies. For ten years at the North Central Regional Educational Laboratory he was a Senior Program Associate where he managed the evaluation unit and evaluated technology use for the states of Indiana and Virginia, and for school districts in Chicago, Miami-Dade, and Los Angeles County. In the area of curriculum development and instructional design, Dr. Quinn directed a beginning reading curriculum development project at NCREL. He also oversaw the design and development of an Internet resource of research-based strategies for raising student achievement in K-12 schools. He is the author of articles, reports, and book chapters on evaluating technology use in education, beginning reading instruction, and development of successful educational programs.

Nancy W. Quinn is an evaluator and instructional designer. She received a master's degree in Instructional Technology from Brigham Young University in 1991. She recently completed studies of statewide beginning literacy programs in three midwestern states. She has evaluated the use of technology as a research tool in a research library. She has also evaluated over a four-year period the use of technology by fourth, fifth, and sixth graders at school and at home. She is a certified teacher and has taught first grade.