Increasing Math Test Scores with the SMART Board interactive whiteboard

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Introduction

This school year (2006-2007), a SMART Board™ interactive whiteboard was brought into my third grade classroom. Its purpose was to give the students an opportunity to increase their state test math scores using interactive technology. The SMART Board interactive whiteboard served as a motivational tool that also augmented attentiveness and comprehension of new math skills. Most of the students had never seen or used a SMART Board interactive whiteboard before. Therefore, they responded with a great deal of enthusiasm and were anxious to get out of their seats when it came time to solve math problems.

There has always been room for mathematics test scores to improve at Parma Community School. It has merely been a matter of how to supplement the central math curriculum: Saxon Math, Inc. Incorporating supplemental material is the key to math achievement. Over the past few years, the students have been given supplementary paper-and-pencil activities, center games, and additional whole-group lessons. However, state and national test scores have remained at a constant level.

By the end of the research period (end of the school year), my goal was to find a variety of ways that SMART Board technology could be used to amplify my third grade students' math skills according to state standards. Would the implementation of math problems presented differently on the SMART Board unit benefit the students' understanding of how to solve them? Can math presented with interactive technology be translated into a paper-and-pencil standardized test? With this focus in mind, the SMART Board interactive whiteboard was used to create a productive learning environment throughout the school year.

Background

Parma Community School is a K-8 charter school located in a suburb just outside of Cleveland, Ohio. There are no more than 20 students per classroom. Of the 20 students who partook in this research, four students participated in the Title One program, two students had Individualized Education Plans, and one student spoke English as a second language.

The technology at Parma Community School is limited to two computers per classroom, as well as one computer lab for the elementary students. Each class visits the computer lab once a week for a computer lesson. In addition to the SMART Board interactive whiteboard utilized for this research, there is also a SMART Board unit in the Title One room and a new unit located in the computer lab. Two classroom computers and one weekly visit to the lab make it difficult to heartily incorporate technology into the curriculum.

Lastly, the current mathematics curriculum used in all classrooms, kindergarten through grade three, is Saxon Math, Inc. This remedial-based program introduces a new concept everyday, which can make it difficult for students to grasp lessons quickly. The lessons are scripted and make it complicated to accommodate the diversity of learners. At the end of each lesson, there is a guided practice that covers material that has already been taught. This practice is a basic black-and-white worksheet. It does not include various forms of Howard Gardner's multiple intelligences. This is where the SMART Board interactive whiteboard will help the students learn new math concepts in a way they can easily understand and that will capture their attention.

Research Procedure

Beginning in October 2006, the students were presented with one or two math problems daily on the SMART Board interactive whiteboard. For the first few weeks, all of the problems were based on one area of mathematics: numbers and number sense. As the year continued, each of the six areas of mathematics was presented, one at a time, in the following order: operations, measurement, geometry and spatial sense, patterns, functions, and algebra, and finally data analysis and probability. Each area had its own focus in order to ensure comprehension.

The interactive whiteboard provided numerous ways to portray each problem. Slide appearance was extremely important to keep students stimulated. If all of the problems looked alike (i.e. same colors, same pictures), the students would lose interest. Every day the

background color changed, the font was modified, and the format of the screen was altered. In addition, the type of interaction changed with each problem. Some problems required dragging images to the correct destination, whereas other slides entailed filling in the blank pieces (i.e. fractions) with color.

The Gallery was an amazing tool to assist with setting up the math problems according to the area of mathematics. For example, in the areas of numbers and number sense and operations, the Gallery provided currency, shapes for base-ten models, and fraction bars and circles. Pictures of animals and objects were manipulated by adding colors and changing sizes with the purpose of creating more appealing fractions and illustrating word problems. The hundred-square grid was used to exhibit how to write numbers using the decimal form for hundredths. In the area of measurement, interactive clocks were use to help students find the time to nearest minute, as well as elapsed time. For questions regarding temperature, an interactive thermometer was available in the Gallery, where the students used their finger to move the red line to show a given temperature. During the Saxon Math, Inc. lessons about measurement with a ruler, I posted the large rulers from the Gallery on the SMART Board screen. Students would have to draw line segments on the board to show a given length. The Gallery also provided geometric solids and polygons for the students to identify and locate the symmetrical line(s). There was not one math problem that could not be represented in a unique way.

Over and above the daily math problems, the students participated in center time every day. During center time, the learners enjoyed using the SMART Board interactive whiteboard for math practice. They applied subtraction, multiplication, division, fractions, time, and place value skills to these websites:

- http://www.iknowthat.com/com/L3?Area=L2_Math
- http://www.aplusmath.com/Games/
- http://www.oswego.org/ocsd-web/games/BangOnTime/clockwordres.html
- www.bigbrainz.com (Timez Attack)

The students displayed excitement when it was their turn to use the SMART Board interactive whiteboard. The comment "Yes!" was not an uncommon reaction when they found out they had SMART Board interactive whiteboard time. These websites were also visited by the entire class when we had occasional extra time, such as five minutes before lunch or at the end of the day.

Multiple Intelligences

As mentioned earlier, Howard Gardner's Theory of Multiple Intelligences plays an important role when planning any type of instruction. In Thomas Armstrong's article *Multiple Intelligences*, he states "…we should also place equal attention on individuals who show gifts in the other intelligences: the artists, architects, musicians, naturalists, designers, dancers, therapists, entrepreneurs, and others who enrich the world in which we live. Unfortunately, many children who have these gifts don't receive much reinforcement for them in school" (1998-2000). The SMART Board interactive whiteboard allowed me to bring all eight learning intelligences to math. Children who preferred bodily kinesthetic learning were able to physically solve problems by touching the interactive whiteboard. Students who preferred to use spatial intelligence learned by reading graphs and separating objects into smaller groups during division problems. Linguistic learners solved word problems by writing about how they found their answer. Some of the math problems required having students write their answer in words. The interpersonal learners shared how they found their answer with a partner, shared with the class, or tutored students who may have had a difficult time understanding the problem. Because everyone learns differently, the SMART Board interactive whiteboard made it easier to include all the intelligences during instruction. Information about this theory can be found at http://www.thomasarmstrong.com/multiple_intelligences.htm.

Standards and Test-Taking Skills

Every problem presented on the SMART Board interactive whiteboard was formatted similarly to those problems that may be found on the Ohio Achievement Test for Mathematics. This was to familiarize the students with the types of questions on the test, in order for them to

feel more at ease when it came time to take the exam in May. Saxon Math, Inc. sets up their math problems in one way, and students have not performed well on previous standardized tests.

A variety of test-taking skills were taught using the SMART Board interactive whiteboard. For instance, we used the highlighter tool to highlight important words in each word problem and/or directions to the problem. When the students caught on to how to manipulate the tools, they eventually learned to put stars and smiley faces next to those important words and sentences. Another skill performed was to draw a picture of what was happening in the problem. At the third-grade level, it is a complex task to decipher which order of operation to use to solve a story problem. By drawing pictures and using picture tools, this concept became simpler over time. Finally, one more test-taking skill that was taught using SMART Board software was to make sure that every multiple-choice answer was considered before answering the problem. Too many times, I have witnessed students read and fill in only the first answer. When reading through all of the choices, we crossed out the answers that did not make sense or were different from the students' answers. These test-taking skills motivated the students to want to use them because they all wanted to go to the SMART Board interactive whiteboard. This daily practice eventually lead to an automatic use of the skills, whether on the SMART Board unit or on paper-and-pencil tests.

Many of the third-grade mathematic content standards will appear on the achievement test. To facilitate better test scores, standards from all six areas of mathematics must be addressed within the length of the research. The following are state standards utilized throughout this research from each of the areas:

- Use place value concepts to represent whole numbers and decimals using numerals, words, expanded notation, and physical models. N*umbers and number sense and operations*
- Count money and make change using coins and paper bills up to ten dollars. *Numbers and number sense*
- Represent fractions and mixed numbers using words, numerals, and physical models. *Numbers and number sense*

- Model, explain, and represent multiplication and division. *Operations*
- Identify and select appropriate units for measuring. *Measurement*
- Tell time to the nearest minute and find elapsed time on a calendar or a clock. *Measurement*
- Analyze and describe properties of two-dimensional shapes and three-dimensional objects. *Geometry and spatial sense*
- Find and name locations on a labeled grid or coordinate system. *Geometry and spatial sense*
- Use patterns to make predictions, identify relationships, and solve problems. *Patterns, functions, and algebra*
- Translate information freely among charts, tables, line plots, picture graphs, and bar graphs. *Data analysis and probability*
- Use physical models, pictures, diagrams, and lists to solve problems involving possible arrangements or combinations of two to four objects. *Data analysis and probability*

Data Collection

There were several means of collecting data throughout the research. Weekly written assessments were given as a tool to have students connect the problems displayed on the SMART Board screen to standardized test format. Each assessment was worth five points, and covered only what had already been taught using the SMART Board interactive whiteboard. The problems were set up in the exact same way as they were presented on the SMART Board interactive whiteboard. However, the numbers, names, and objects were changed to make certain that the students comprehended the problem. As we continued to proceed to each area of mathematics, an equal number of problems from each area were placed on the assessment. Most of the problems were multiple-choice responses, but eventually short answer and extended response were incorporated.

After grading the assessments, remediation took place with those students who did not receive all five points. Most of the remediation was in a small group setting. We would review

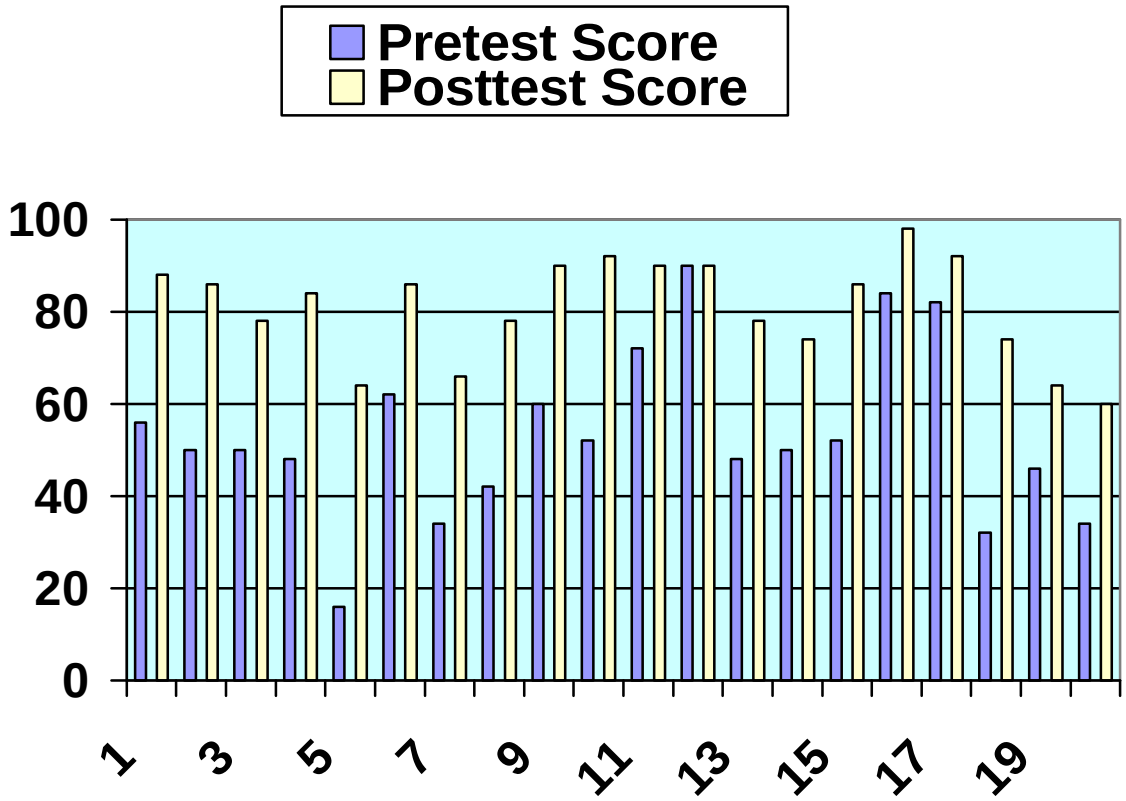
the problem(s) that was missed on the SMART Board interactive whiteboard. Other remediation occurred as a whole group when a majority of the students did not answer a problem correctly. Again, the SMART Board interactive whiteboard was used as a motivational tool, even when conducting remediation, because as the students were eager to review their assessments.

Another form of data collection was a pretest and posttest at the beginning and end of the research period. The test was arranged similarly to the Ohio Achievement Test. Therefore, by sampling the students' knowledge prior to using the SMART Board interactive whiteboard, I could measure the impact that the SMART Board interactive whiteboard and this research had on the students. The posttest gave a rough estimate as to how the students would perform on the actual state exam, which brings me to the final piece of data: the Ohio Achievement Test for Mathematics. This is a test taken in the month of May, is given by the state of Ohio, and holds each school responsible for their students' performance. Please refer to the next section for the outcomes of each of these data collections.

Results

The weekly assessments proved useful when determining which students needed intervention. Though the scores may have been lower than anticipated, the remediation was successful, especially for those students who work better in small groups or individually. The graph below exhibits the total class scores of every weekly assessment. The total class score is a maximum of one hundred points and can be calculated by adding the total number correct on all twenty students' assessments. During weeks 15, 18, and 19, assessments with extended response questions were given. Whole-group remediation was given, and the total class score for week 19 increased. As the math problems extended themselves to all of the areas of mathematics, the general total class scores decreased.

The following graph represents the comparison between the pretest and posttest scores taken at the beginning and the end of the research. My goal was for students to earn a score of at least 70%. From only four students earning a score with a minimum of 70% in the fall, 16 students received a total greater than this goal on the posttest taken in May. A total of 95% of the students increased their test score by at least 10%, whereas only one student (5%) remained the same. This is an encouraging indication of the Ohio Achievement Test results.



Finally, the results of the Ohio Achievement Test for mathematics could not have been better! For the first time, 100% of the students passed the exam. Two of the students scored in the advanced category, while three students were accelerated. The SMART Board interactive whiteboard truly proved to be an effective tool that amplified motivation, stimulation, and understanding in math.

References

Archer, Jeff. (1998). The Link to Higher Scores [Electronic version]. *Education Week on the Web*. Retrieved June 27, 2006, from http://counts.edweek.org/sreports/tc98/ets-n.htm

Armstrong, Thomas. (1998-2000). Dr. Thomas Armstrong [Electronic version]. *Multiple intelligences*. Retrieved June 14, 2007, from http://www.thomasarmstrong.com/multiple_intelligences.htm

Duncan, Sally, & Thompson, Kay. (2004). *You Can Do It!.* K&S Associates.

Perfect Learning Corporation. (2005). *How to Get Better Test Scores*. Logan, Iowa: Author.