GRADE THREE STUDENTS CLOSE THE LEARNING GAP USING SYMPHONY MATH

SYMPHONY LEARNING: RESEARCH REPORT 01 24 2011

ABSTRACT

The purpose of this study is to investigate the effects of the Symphony Math software intervention program on the mathematics skills of elementary school students who used the program as a supplement to their core curriculum. The design of this study was quasi-experimental, using 1 grade three class as the experimental group and 4 grade three classes as the control group. All students were administered 3 assessments in the fall and again in the spring. The sample consists of 100 grade three students at Jenkins Elementary in Scituate, Massachusetts. Following staff training on Symphony Math, the experimental group used the program during the 2009-2010 school year. On average, the class that used Symphony Math made statistically significant improvements compared to the control group.

INTRODUCTION

A number of research studies have demonstrated that struggling math students often have an underdeveloped understanding of foundational numeracy. At Jenkins Elementary in Scituate, Massachusetts, beginning of year testing revealed that one class dramatically underperformed their peers in other classes of the same grade on beginning of the year math benchmark testing. The school staff elected to support the weaker class with a supplemental mathematics computer program. The math computer program was specifically designed to support student learning by developing a strong foundation in number and operation skills and concepts. This research report summarizes the implementation of this program and subsequent results.

PARTICIPANTS

Jenkins Elementary is one of four K-6 elementary schools serving students in the community of Scituate, Massachusetts. A comprehensive K-6 education is delivered to each of its roughly 620 students. The mission of the school is that by working with the parents and community, the staff is committed to the successful development of the whole child.

The experimental group was selected through the process of beginning of the year benchmark testing. On average, one class of grade three students dramatically underperformed their peers in the four other grade three classrooms in math. The class with the lower math scores was assigned a computer based math intervention program as a supplemental component to the school's core curriculum. The other grade three classes served as the control group and had no exposure to the computer math program.

IMPLEMENTATION

The teacher for the experimental class was trained on how to use the computer intervention program. The training included orientation to the program user-interface, overview of the reports, and instruction on how to use the program dashboard to monitor group and individual progress. The training also included developing an

implementation plan to insure that all students would be able to use the computer program the required minimum of 45 minutes per week. The program was installed on the computers in the classroom. Instructions were sent home with students on how parents could install the program at home for student use.

INTERVENTION

The intervention for the experimental group consisted of weekly use of the Symphony Math computer program. Symphony Math is an intervention program designed to help students develop a profound understanding of the most important mathematical concepts. Many students struggle to become proficient in math because they do not have the opportunity to master foundational concepts with sufficient depth. In an age when most curricula value covering a large number of topics, some students are falling through the cracks. They need more time and more practice working with the big ideas of mathematics in order to develop the proper foundation.

Symphony Math provides students with the experience of learning and thinking about the most important mathematical concepts. This experience provides the necessary foundation for a successful future of math learning. Symphony Math helps students achieve this solid mathematical foundation by implementing several key research-based pedagogic strategies.

The conceptual sequence of *Symphony Math* consists of a tightly connected progression of the most important mathematical ideas. These underlying "big ideas" are important because they provide the foundation for later mathematical learning.

A student does not move on to the next concept in the Symphony Math sequence until she has mastered the current concept. One concept follows logically from the previous concept. While a student is working on a new concept she sees review concepts that help support her learning of the new concept. This process helps the student connect new knowledge to previous knowledge.

The pedagogic style of Symphony Math emphasizes thinking, figuring out, and making connections. The program is designed to be used as a complement to the classroom learning experience. Students receive direct instruction and group learning in a classroom setting. The program provides the opportunity for individual practice at the developmental level of each student. The style of this practice encourages independent thinking and problem solving, and this is accomplished through the use of three important pedagogic strategies.

Symphony Math works with each student at his or her developmental level. The "dynamic branching" of the program and detailed progression of the scope and sequence allows students to work within their developmental zones. The amount of time and practice that students need to understand mathematical concepts is not uniform. Symphony Math allows students to spend the time they need mastering foundational concepts. In addition, the program quickly moves students through the conceptual progression of the program to identify their area of need. Once the area of need has been identified, the program slows the progress until the necessary understanding has been achieved.

ASSESSMENTS

Pre-tests and post-tests were administered at the beginning and end of the school year. The pre-tests were administered in September of 2009 and consisted of the AIMSweb Mathematics Computation and Mathematics Concepts and Applications. These measures were again administered in May of 2010. Additionally, all

students in the study were evaluated by benchmarks tests from the Everyday Math program that are designed to mimic the Massachusetts Comprehensive Assessment System (MCAS).

ANALYSIS

The pre- and post-test data were converted to gain scores and were analyzed using t-tests. Scores for the AIMSweb Mathematics Computation assessment were converted to a percentage correct out of total possible items. The data from the AIMSweb Mathematics Concepts and Applications assessment was analyzed in its raw score form of number correct. T-tests were conducted on the gain scores of each measure to determine if there was a statistically significant difference between the performance of the experimental group compared to the control group.

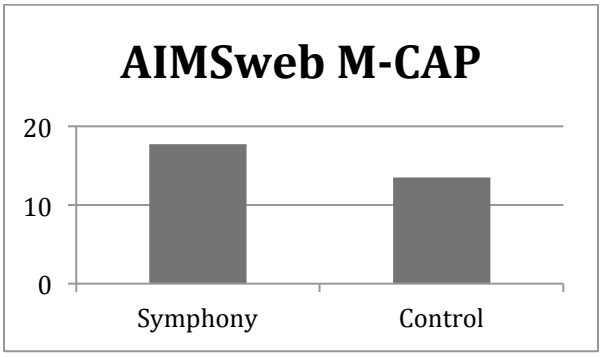
PARTICIPATION

The students in the experimental group used the Symphony Math intervention for an average of 27 hours and 40 minutes over the course of the 2009-2010 school year. One student used the program for as much as 47 hours, while another used for as little as 17 hours. Forty-seven percent of the students completed the program.

RESULTS

For two of the three assessments the gain score for the Symphony group was statistically significantly larger than the gain score for the control group at the .05 level. For the third assessment the gain score for the Symphony group approached statistical significance, with a p-value of .08. On the measures of concepts and applications, computation, and MCAS benchmarking, the Symphony group was associated with larger gain scores than the control group.

AIMSweb Concepts and Applications

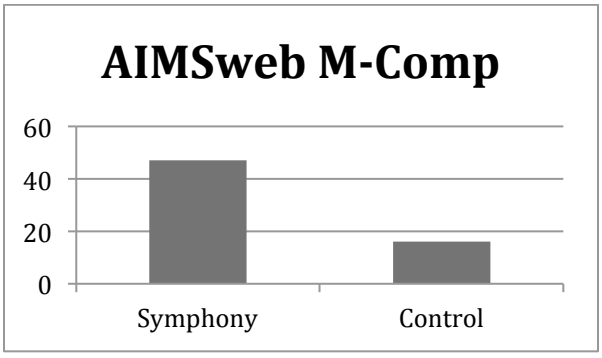


		Fall 2009		Spring 2010		Gain
Group	n	Mean	SD	Mean	SD	
Symphony	19	62.63	10.74	80.37	8.36	17.74~
Control	73	68.52	10.21	82.03	8.34	13.51

~ Statistically Significant at the $p < .10$ level

On the AIMSweb Mathematics Concepts and Applications assessment the Symphony group achieved an average gain score of 17.74. The control group achieved an average gain score of 13.51. The difference between these two gain scores approaches statistical significance with a p-value of .08. It appears that the Symphony group is associated with larger gain scores for concepts and applications.

AIMSweb Mathematics Computation

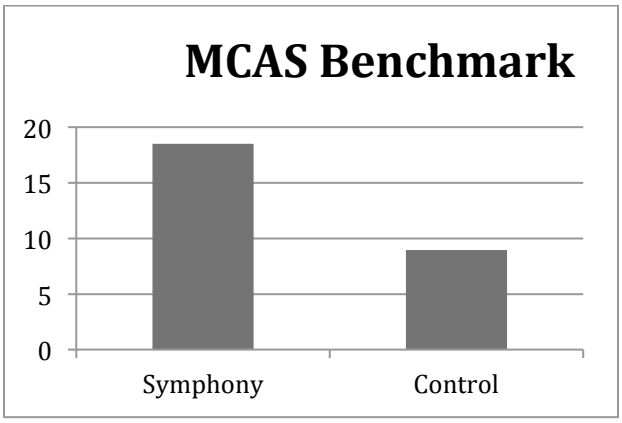


		Fall 2009		Spring 2010		Gain
Group	n	Mean	SD	Mean	SD	
Symphony	19	24	12	70	20	47***
Control	73	53	19	69	18	16

*** Statistically Significant at the p < .001 level

On the AIMSweb Mathematics Computation assessment the Symphony group achieved an average gain score of 47. The control group achieved a gain score of 16. This difference is statistically significant at the p < .001 level and is one of the strongest differences identified in the analysis. The Symphony group is associated with dramatically stronger computation scores.

Everyday Math MCAS Benchmark



		Fall 2009		Spring 2010		Gain
Group	n	Mean	SD	Mean	SD	
Symphony	19	67.68	17.71	86.21	14.67	18.53*
Control	73	74.07	14.55	83.03	14.79	8.96

* Statistically Significant at the p < .05 level

On the Everyday Math MCAS Benchmark assessment the Symphony group achieved a gain score of 18.53. The control group achieved a gain score of 8.96. The difference in gain scores is statistically significant at the p < .05 level. The Symphony group is associated with higher scores on the Everyday Math MCAS Benchmark assessment.

On average the Symphony group increased their post-test scores sufficiently to eliminate the gap with the control group on the various assessments. In other words, while the Symphony group underperformed the control group to a statistically significant degree at the beginning of the year on two of the three assessments, by the end of the year these differences had been erased.

CONCLUSION

In the fall of 2009 Jenkins Elementary in Massachusetts identified that one of its third grade classes was underperforming the other classes in math. A statistical analysis has confirmed that this difference is statistically significant. To support the learning of these students in the underperforming class the school implemented the Symphony Math program in the underperforming classroom (the Symphony group). Compared to a control group consisting of the other four grade three classes, the Symphony Group outperformed the control group and closed the learning gap. The Symphony group made more progress over the course of the year on three different assessments. By the end of the year there were no significant differences between the Symphony group and the control group. This provides evidence to support the conclusion that the Symphony Math program was effective in supporting the learning of the underperforming classroom.

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