

# Effects of SuccessMaker Math on Students with Learning Disabilities in Inclusive and Special Education Classrooms



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## **Keywords**

*SuccessMaker Math, learning disabilities, inclusive classrooms*

## **Abstract**

*During the 2002 school year, 89% of sixth grade students in the Reynoldsburg City School District who were identified with learning disabilities scored “not proficient” on the Ohio Mathematics Proficiency Test. Reynoldsburg is committed to increasing student achievement and documenting gains in all learners and decreasing discrepancies between regular and special education students. There is an increased need for individualized instruction in both the inclusion and in special education classrooms. Technology offers success-oriented individual solutions for children with disabilities.*

*This study was designed to document gains made by students with learning disabilities who used the integrated learning program SuccessMaker Math. Eighteen youngsters were tracked across a two-year period; an additional 28 youngsters were tracked across a one-year period. Both groups spent at least 16 minutes daily and a minimum of 80 minutes weekly on the program. For youngsters tracked across two years, 78% were able to move into regular education math classrooms. Eighty-eight percent of the participants made at least one year of growth.*

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## Introduction

### *Can SuccessMaker Math Meet the Accountability Test?*

Increasing student achievement, documenting gains and facilitating life-long learning requires individualization of classroom instruction. In today's inclusive environments, advancing academic achievement of the child with a learning disability becomes even more challenging for teachers. Technology has offered some highly success-oriented, individual solutions for children

with disabilities.

Schools demand research-based learning models with proven results, while educators demand accountability paired with learning components that will support student achievement now and in the future. SuccessMaker Math, an integrated learning system, is designed according to key instructional principles, validated models of learning effectiveness and critical components of skill mastery. SuccessMaker meets state and national content and performance standards. Educators are first able to establish instructional goals that meet specific educational criteria and then to measure student achievement through performance data. Based on data gathered from a student's work, the program provides individualized instruction that enhances achievement (Pearson Digital Learning, 2003).

SuccessMaker Math presents individualized interactive lessons, adaptable so that each student can reinforce weak skill areas and understand basic math concepts. Many students who have learning disabilities need additional support and assistance to help them learn. The programmed instruction includes instructional scaffolding, multimedia presentations and basic math foundations. SuccessMaker Math meets the student where he or she is and moves each forward into higher levels of math (Pearson Digital Learning, 2003).

Ideally, instructional principles determine teachers' selection of methods and materials to use for instruction. This software meets several criteria for effective instruction, including both accommodating the needs of all students in a heterogeneous classroom and offering achievement growth commensurate to time on task (Slavin, 1987).

The strategy of mastery learning promotes high levels of learning by all students; however, this strategy may be difficult to implement with students with learning disabilities in the classroom because of the diversity of learning styles and the different rates of skill acquisition. Consistent computer-based instruction can assist by providing

students with academic difficulties opportunities for mastery through automaticity and overlearning. (Vockell and Mihail, 1993, pp. 38-43)

SuccessMaker allows students the chance for technology exploration while learning how to solve the type of multistep problems that occur in real life. Multimedia that can embed basic skills practice within realistic situations enable teachers to improve their instruction for learning-disabled students (Wissick and Gardner, 2003). Maximizing instructional time, engaging learners, and raising student achievement in order to make as much use of the allocated time as possible is when student learning increases (Eggen and Kuachak, 2004).

Scores of educational programs have been implemented over the years, usually with little solid data on whether efforts have been effective in raising achievement. Terrell H. Bell, Secretary of Education from 1981 to 1985 under President Ronald Reagan, called for both extensive use of technology and educational research to validate instructional models (Bell and Elmquist, 1991). President George W. Bush's administration continues to push for "scientifically-based research" to base school improvement efforts on evidence of practice and effectiveness. Evaluation studies using SuccessMaker courseware have shown improved student achievement with results validated by standardized testing and models of learning.

In a meta-analysis of 22 published evaluation studies of SuccessMaker, Kulik (1987) reported that the effects were especially large and consistent with the program. Average gains of 1.4 years were typical with a yearlong program and gains of 2 years were also reported. In a large-scale study conducted at Leicester University, Rogers and Newton (2001) reported that students showed achievement gains of 1.7 years in mathematics after only six months of SuccessMaker instruction. In small-scale studies, the courseware appeared to be effective with special needs students (Rogers and Newton, 2001). During 1993-95, district administrators in Landisville, Pennsylvania completed studies of 2000 fourth and fifth graders that demonstrated significant achievement in mathematics after the use of SuccessMaker Math. The percentage of students in the lowest quartile on the Stanford Achievement Test was reduced from an average of 17% to 6% and the percentage of students in the highest quartile increased from 33% to 54% (Laub and Wildasin, 1999).

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Students with learning disabilities often struggle with tests and assessments because of comprehension difficulties, attention deficits and test anxiety. After 300 initial placement problems (IPM), the SuccessMaker program automatically places students at their functional level. A student's placement at the correct level of difficulty is based on the student's actual work, not on placement tests. This makes placement invisible to the student and occurs without the anxiety of testing.

Student data is stored automatically and students continue their individualized instruction with criterion-referenced assessment throughout the school year. Criterion referenced in this context means two things. One, that the assessment measurements are performance

based, indicating when students have learned particular content. Two, that the measures are referenced to particular levels in standards and testing programs. (Lannigan, et al., 2002, p. 5)

Students' varied abilities will undoubtedly lead to uneven progress across the range of concepts and skills in a given curriculum. The concepts and skills are organized into homogeneous strands: one for fractions, one for word problems and so forth (Suppes and Zancotti, 1996, pp.155-156). Students work at appropriate levels within each strand.

The integrated learning system does manage the delivery of curriculum material so that students are presented with individual programs of study. The courseware responds with various strategies including a systematic review of mastered computational skills to ensure continued fluency. The quality of pedagogy and integrity of the curriculum content are crucial aspects of evaluation. SuccessMaker plots pathways through the curriculum matching the pace and level with individual student needs (Rogers, et al., 2001).

In their book, *Foundations of Probability with Applications*, the developers of SuccessMaker Math (Suppes and Zancotti, 1996) outline components necessary for mastery. Common sense suggests that not all concepts are of equal importance and that time devoted to specific mastery should vary. The most feasible approach to develop curriculum is to look at standards of state and local school systems, count the empirical frequency of material in text books, and then pool this data into strands organized by concepts (Suppes and Zancotti, 1996).

Probability theory suggests that while the number of student responses is large, the probability of guessing the correct answer is close to zero. With this notion, Suppes and Zancotti built a foundation when creating SuccessMaker so that during the delivery of questioning sessions only correct responses are scored and weighted based on total attempts. Another important feature of Suppes and Zancotti's approach to the prediction of student progress is that they consider only global progress, not performance on individual exercises. Students are measured based on success of skill acquisition and are not held back by errors.

While there is a body of evidence that supports the use of SuccessMaker with a general population, there is very little research on the effects of the program with L.D. youngsters.

FYI

Click [here](#) to see the SuccessMaker Math site.

## Action Research Report

### *Context*

This study examined the effects of consistent daily use of SuccessMaker Math on middle school students who have an identified learning disability. The question I wanted to answer is: *What effect does SuccessMaker Math have on learning disabled students in both the inclusive and the self-contained mathematics classrooms?*

The study was conducted in a computer lab at Reynoldsburg Junior High School. Reynoldsburg is a suburb located in the Columbus, Ohio Metropolitan area. The lab, situated within a larger computer lab, is partitioned off so that it is a classroom of its own. SuccessMaker is installed on

ten computers. Reynoldsburg Junior High School serves a total student population of 1,158 students in grades 7-8. The racial/ethnic composition is 82% Caucasian, 15% African-American, with the remaining 3% of the student body Mid Eastern, Asian or Hispanic.

### *Design*

The study included data collection on one group (N =18) over a two-year period and another group (N = 28) over a one-year period. Both groups began their participation in the 7<sup>th</sup> grade. After students attempt 300 initial placement problems (IPM), the SuccessMaker program automatically places students at their functional level. Students spent at least 16 minutes daily and a minimum of 80 minutes weekly on the computer. The number of weeks ranged from 20 to 23, based on the individual's skill levels, attendance and rate of progress. Student achievement as well as time on program were measured daily.

### *Participants*

In this study, learning-disabled students are defined as individuals whose achievement does not match their ability. Students with learning disabilities show significant discrepancies between what would be expected, given the individual's scores on ability measures, and what is actually demonstrated on academic classroom material (Reiff, Gerber, and Ginsberg, 1993).

Students selected came from two seventh grade teams. Of the 46 participants, 31 students had identified learning disabilities in mathematics. The other 15, while labeled L.D., did not have significant weakness in mathematics according to their Individual Education Plans (IEP's). This number of participants represents 24% of the total special education population enrolled at Reynoldsburg Junior High.

### *Procedures*

Students were scheduled for daily 16-minute sessions. Each student was assigned a specific class time that remained constant throughout the study. Students had access to scrap paper and pencils, and the program itself contained a built in calculator for multiple step calculations. A certified math teacher, employed by the district to manage the lab and generate weekly gains and management reports, monitored the students. Students were encouraged to ask questions as they worked through the exercises. Scores were recorded on tracking sheets daily by students and teacher in addition to data being collected and recorded internally by the program.



**Helping Students**

## **Evaluation/Findings**

### *Study One (2002-2003 group)*

Eighteen L.D. 7<sup>th</sup> graders began to use SuccessMaker Math in late September of 2002. Students' math achievement ranged from mid-third to mid-fifth grade. Their grade level mean started at 4.4 as determined by their initial performance on the 300 placement problems (IPM). The group,

approximately 2 ½ years below their actual grade level in mathematics achievement, spent an average of 25.1 hours on the program. The mean number of sessions was 97.

At the end of the year, the group ranged from beginning fourth grade to beginning sixth grade and was achieving at a mean grade equivalent of 5.2 (a gain of 8 months). Correlation between time on program and growth across the year was  $r(18) = .688$ ,

$p < .01$ . Figure 1 illustrates that all but one student who spent at least 26.0 hours on the program made gains of 9 calendar months, which is equivalent to one school year's growth.

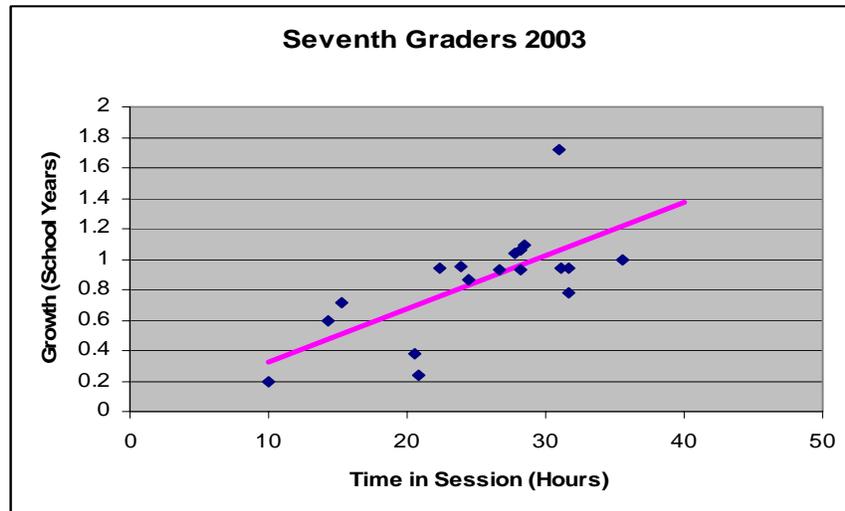


Figure 1. Correlation between time and growth 2003

Five of the original 18 students moved from the intervention classroom to the general education classroom and continued to maintain a C or better average. The other 13 students remained in the pullout intervention classroom and also maintained a C or better average.

Baseline data at the beginning of 2003- 2004 for the 14 students, now 8<sup>th</sup> graders, who continued to participate, indicated that the group began the year at a mean level of 4.9. Four students from the original group were eliminated from the sample. Two students moved from the district, one was expelled and one student was identified late and completed only 10 hours of the program.

By mid-April, these students mean grade level was 5.8. The average time-on-program was 25.38 hours. The mean growth for these students during the second year of participation was nine months. The mean number of sessions was 87. The correlation between time on program and growth in 8<sup>th</sup> grade was  $r(14) = .534$ ,  $p < .05$ .

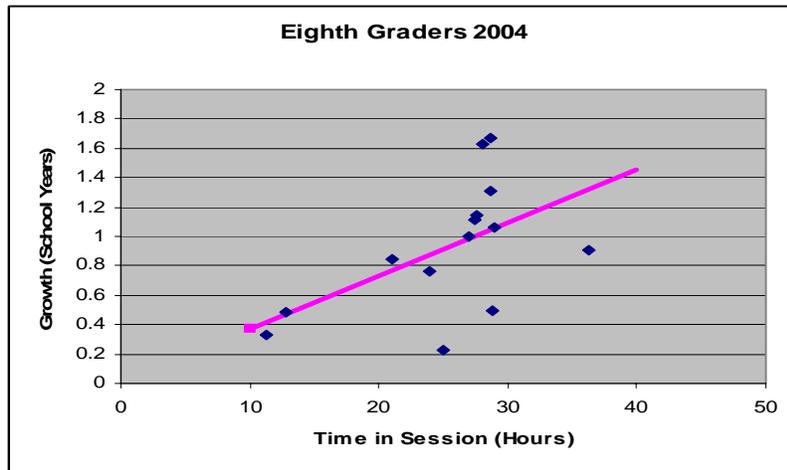


Figure 2. Correlation between time and growth 2004

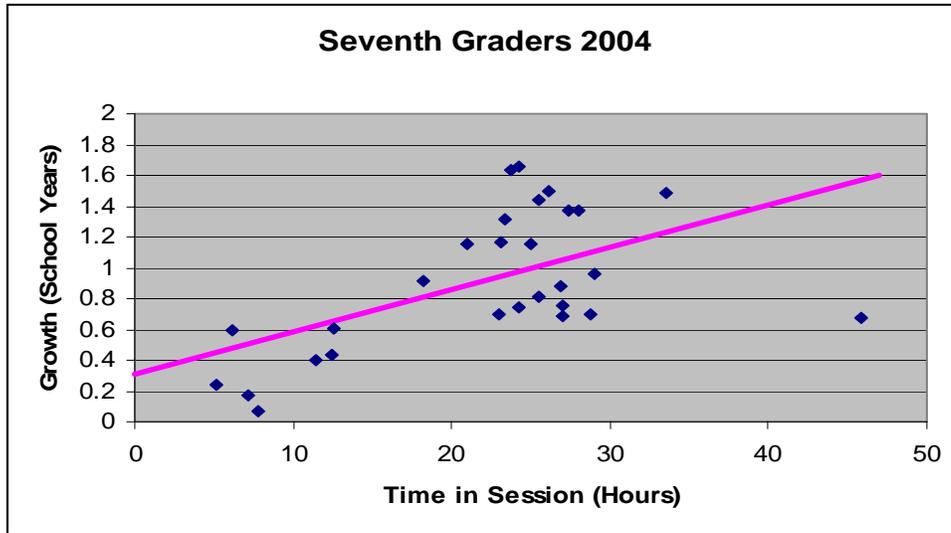
While it appeared that the group lost approximately 3 months over the summer, attrition actually played a major role. The four students who were eliminated had year-end scores ranging from 4.95 to 6.17. The remaining 14 students, once re-enrolled in the program, continued to demonstrate growth at approximately the same rate as they did during year one. Figure 2 illustrates that, of the fourteen students remaining, all but two who spent at least 26.0 hours made 9 months or more of growth.

In addition to the five students who moved from pullout math into the general math classroom during 7<sup>th</sup> grade, an additional six students returned to regular math classes during 8<sup>th</sup> grade. Out of 14 students who were followed for two years, 78% were able to be successful in the general education classroom.

#### *Study Two (2003-2004)*

Year one of the study was replicated during 2003-2004 on a group of twenty-eight 7<sup>th</sup> graders. This study tested the SuccessMaker Math program again to find out if the results would generalize to other L.D. participants. Twenty-eight L.D. 7<sup>th</sup> graders began to use SuccessMaker Math in mid September of 2003. Students' math achievement ranged from late second to beginning-fifth grade. Their grade level mean started at 4.0. The group, approximately 3 years below their actual grade level in mathematics achievement, spent an average of 22.12 hours on the program. The mean number of sessions was 91.

At the end of the year, the group ranged from mid-third grade to mid-sixth grade and was achieving at a mean grade equivalent of 4.9 (a gain of 9 months). Correlation between time on program and growth across the year was  $r(28) = .561$ ,  $p < .01$ . Figure 3 illustrates that all but two students who spent at least 26.0 hours on the program made gains of at least 7 months, which is equivalent to two-thirds of a school year's growth.



The total number of students from 2003-2004 who moved from the math pullout classroom into the general education classroom and continued to maintain a C or better average was nine (or 32 % of the population).

## Discussion

The data reported support the use of SuccessMaker Math on a consistent basis with learning disabled students. As 7<sup>th</sup> graders, students in both study groups as demonstrated average growth ranging from .85-.91 months or almost one full school year. These same participants made that growth, on average, in instructional time ranging from 22.12-25.38 hours per academic year. Compare the instructional time spent on SuccessMaker with ten 80-minute classroom block periods of instruction a month and the significance of SuccessMaker Math becomes more evident. Students spend a total of 800 minutes (or 13.55) hours a month in classroom instruction for a total of 120.07 hours per academic year. This is a difference of approximately 95.35 additional hours teachers spend in classroom instruction in order to make, optimistically, one year's worth of growth.

Student learning becomes stronger because SuccessMaker Math actively engages students in learning activities, promotes competency, and focuses on effective instructional principles and achievement.

## Conclusion

More than 22 % of the Reynoldsburg Junior High School population has been identified as special needs (Reynoldsburg School Net, 2004). For the 2003-2004 school year, the average class sizes are thirty-one students in the general education classroom and sixteen students in the special education classroom. While the focus of this district has always been driven by

proficiency and standards based education which is a very positive thing, a negative consequence is that more and more special education students are being serviced unsuccessfully in the general education classroom. Providing individualized, engaged, technology-based instruction to special education students is successful on two fronts. First, it certainly demonstrates to the student learner that success and achievement are possible; second, it gives the classroom instructor the means to engage students while targeting necessary skills, requires limited preparation time and provides diagnostic measurement tools that track growth and need areas. Student growth is possible with little teacher interaction or correction.

Reynoldsburg is certainly not unique in either its ethnic diversity or its service to at-risk students. It is imperative that we share results and successes with other districts so that students who are not achieving at grade level can benefit from individualized, engaged, technology driven programs that accelerate skill development and standards based mastery.

The results of this quantitative report strongly support the daily use of SuccessMaker Math with students who have identified learning disabilities. A larger group of students studied over a longer time period would help to validate the promising results described in the current study.

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