

Differences in Grade 8 Students' Math Achievement as a Function of Saxon Math Instruction

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ABSTRACT

Student performance on the Grade 8 Texas Assessment of Knowledge and Skills Math test for all students ($n = 789$) who took the TAKS math assessment in 2007 ($n = 167$), 2008 ($n = 198$), 2009 ($n = 207$), and 2010 ($n = 217$) was examined to determine the extent to which differences were present as a function of Saxon Math instruction. Statistically significant differences were yielded in the percent of students who met the math standard, as well as in the percent of students who met the Commended Performance standard, both small effect sizes. In the non-Saxon Math school year, the percent of students who achieved Met Standard were well below the percent of students who achieved Met Standard after receiving one, two, and three years of math instruction in the Saxon program. Similarly, the percent of students who reached Commended Performance in the non-Saxon school year were considerably lower than the percent of students who received one, two, and three years of Saxon Math instruction. Implications are discussed and suggestions for further research are made.

Keywords:

INTRODUCTION

Similar to math instruction in other states, many diverse approaches are used in math instruction in Texas school districts. One program, a revised edition of the Saxon Math middle school program, was published in 2007 and included for adoption on the Texas state approved textbook list in 2007 (Texas Education Agency, 2013b). In the six years since the adoption and subsequent readoption of Saxon Math for middle school, no research has been published concerning the effects the revised curriculum has on student achievement. As such, the focus of this study was on the relationship between instruction in Saxon Math and Grade 8 students' math achievement.

A body of research (e.g., Agodini & Harris, 2010) exists concerning Saxon Math curriculum as compared to other math programs and Saxon Math instruction in relation to improvement in student achievement (Resendez & Azin, 2008; Resendez, Fahmy, & Azin, 2005; Resendez, Sridharan, & Azin, 2007). However, no research was located in which the 2007 revised Saxon Math curriculum was examined. Accordingly, the literature we reviewed was on student performance on the Saxon Math curriculum, prior to its current revision. Readers should note that the three studies that were located were all conducted through PRES Associates, an independent educational research firm contracted by Saxon Publishers.

Resendez et al. (2005) conducted an investigation to determine the effects of Saxon Math on student math achievement as indicated by the Texas Assessment of Academic Skills (TAAS) and the Texas Assessment of Knowledge and Skills (TAKS). Participants were Grade 6, 7, and 8 students in Texas schools using Saxon Math programs between 1993 and 2004 ($n = 15$). Control schools ($n = 15$) were randomly selected from matched comparison schools identified by the Texas Education Agency for the same years. Students were grouped into three cohort samples to answer three distinct evaluation questions. Concerning the improvement of math performance as a result of Saxon instruction, statistically significant growth in TAAS and TAKS math performance was documented for all three grade levels of students, higher than for the matched sample. Additionally, students who used Saxon Math from Grade 6 through 8 had a higher passing rate on the math exit level test. Finally, students labeled Limited English Proficient, special education, and at-risk who were taught via the Saxon Math program outperformed their counterparts who were not taught via the Saxon Math program. In conclusion, Resendez et al. (2005) stated that eight years of archival data indicated the Saxon Middle School Math program was associated with positive outcomes on two Texas statewide assessments.

In a study conducted with archival data from the South Carolina Department of Education, Resendez et al. (2007)

analyzed the relationship between Saxon Math programs at the elementary and middle school levels with student achievement on South Carolina's statewide assessments, the Palmetto Achievement Challenge Test (PACT). Data for Grades 3 through 8 from the 2001-2002 through the 2005-2006 school years were analyzed in this comparison study. Schools using Saxon Math ($n = 20$) were matched to schools not using the program ($n = 20$). Schools were matched based on characteristics such as grade-span, enrollment, gender, ethnicity, and free/reduced lunch rates. Major findings from this study included statistically significantly increased math performance on the PACT by both elementary and middle school students as they progressed through grade levels. All subgroups (i.e., males and females, minorities and non-minorities, students who were and were not economically disadvantaged, students who were and were not Limited English Proficient, and students who were and were not enrolled in special education) at the elementary level and middle school levels demonstrated increasing trends in math performance. Finally, although the average performance of students in all grade levels of Saxon schools was statistically significantly higher than the average performance of non-Saxon students, both the Saxon group and the control group showed similar increases in performance over time. Resendez et al. (2007) concluded from this investigation that although the Saxon math was related to student improvement in math skills over time, students performed as well from instruction in other math programs in this sample of schools.

In a related study conducted with archival data from the North Carolina Department of Education, Resendez and Azin (2008) analyzed the relationship between Saxon Math programs at the elementary and middle school levels with student achievement on the North Carolina End of Grade (EOG) state exams. Data for Grades 3 through 8 from the 2002 through the 2007 school years were analyzed in this comparison study. Schools using Saxon Math ($n = 57$) were matched to schools not using the Saxon Math program ($n = 68$). In comparing before-and-after Saxon implementation in schools, statistically significant improvement was documented in state assessment scores after the schools implemented Saxon Math. Improvement was not only immediate, but enduring increases in achievement scores were also evident. Gains in math performance continued to increase over time. Student groups (i.e., White, minority, special education status, Limited English Proficient, free/reduced lunch status) showed increases in math performance as well. Resendez and Azin (2008) documented that the Saxon Math program positively impacted student math achievement.

Purpose of the Study

The purpose of this study was to examine the effect of Saxon Math on Grade 8 student math achievement in a selected Texas school district. The data utilized for this study were chosen because of the Texas adoption of the revised Saxon Math curriculum in 2007 and the final four years of state assessment data available during the years of Saxon Math instruction under the TAKS system.

Research Questions

The following research questions were addressed in this study: (a) What is the difference in Grade 8 students' Met Standard scores as a function of Saxon Math instruction?; and (b) What is the difference in Grade 8 students' Commended Performance scores as a function of Saxon Math instruction?

Method

Participants

A middle school in one mid-sized, rural Texas school district was used for this study. One high school, two middle schools, and five elementary schools comprised the district. The student population of the district increased from 5,606 students in 2007 to 6,263 students in 2010. With respect to this particular middle school campus, the student population of the participant campus consisted of Grades 6 through 8 with an ethnic distribution of 9.6% Black, 23.5% Hispanic, 65.7% White, and 62% of students who were economically disadvantaged (Texas Education Agency, 2013a).

Data utilized in this research consisted of Grade 8 students' math scores for all students who took the TAKS math assessment in the 2007, 2008, 2009, and 2010 school years. Grade 8 students in 2007 were students who received traditional math instruction and were the last group of students before the revised Saxon Math curriculum was implemented. In each consecutive year, beginning in 2008, students received one, two, and three years of instruction in Saxon Math, respectively. Thus, data from four intact groups of Grade 8 students were analyzed in this investigation.

Instrumentation and Procedures

Archival data for the Grade 8 TAKS math assessment for the 2007 through the 2010 school years were obtained from the school district's student assessment data management system, Data Management for Assessment and Curriculum (DMAC) and imported into an excel file. The excel file was merged using the Statistical Package for Social Sciences (SPSS). Included in the DMAC data file were four values utilized for this study: (a) Met Standard; (b) did not meet standard; (c) met Commended Performance; and (d) did not meet Commended Performance.

Definition of Terms

Met Standard is defined by the Texas Education Agency (2013c) as performance at or above the state passing standard. Students who achieve this standard have sufficient understanding of the mathematics curriculum as outlined by the Texas Essential Knowledge and Skills (TEKS) curriculum. Commended Performance is defined as academic achievement that is considerably above the state passing standard. Students who achieve this standard have a thorough understanding of the mathematics TEKS curriculum (Texas Education Agency, 2013c). Saxon Math is an evidence-based, core mathematic program for grades K-12. The middle school program is textbook-based with embedded differentiated instruction; the curriculum includes algebraic reasoning and in-depth problem-solving (Houghton Mifflin Harcourt, 2011).

Results

To determine the extent of the relationship between Saxon math instruction and Grade 8 students’ state assessment scores, a Pearson chi-square was conducted (Slate & LeBouef, 2012). Because frequency data were present for all variables, all variables were categorical, and the large sample size provided for a per cell size of greater than five, the assumptions for a chi-square procedure were met.

For the first research question concerning the relationship between Saxon Math instruction and students' Met Standard assessment scores, the chi-square analysis resulted in a statistically significant difference, $\chi^2(3) = 23.66, p < .001$. Using Cohen's (1988) criteria, this difference represented a small effect size, a Cramer's V of .17. As depicted in Table 1, the student group that did not receive Saxon Math instruction had 12.3% fewer students meet the Met Standard than the group that received one year of Saxon math instruction. For the student group that received three years of instruction in Saxon Math, 23.5% more Grade 8 students met the Met Standard on the state accountability math exam (see Figures1 and 2).

Table 1

Numbers of Students and Percentages of Math Met Standard and Did Not Meet Standard as a Function of Saxon Math Instruction

Student Group	<i>n</i>	Did Meet Standard	Did Not Meet Standard
Year One Students	167	53.9%	46.1%
Year Two Students	198	66.2%	33.8%
Year Three Students	207	67.1%	32.9%
Year Four Students	217	77.4%	22.6%

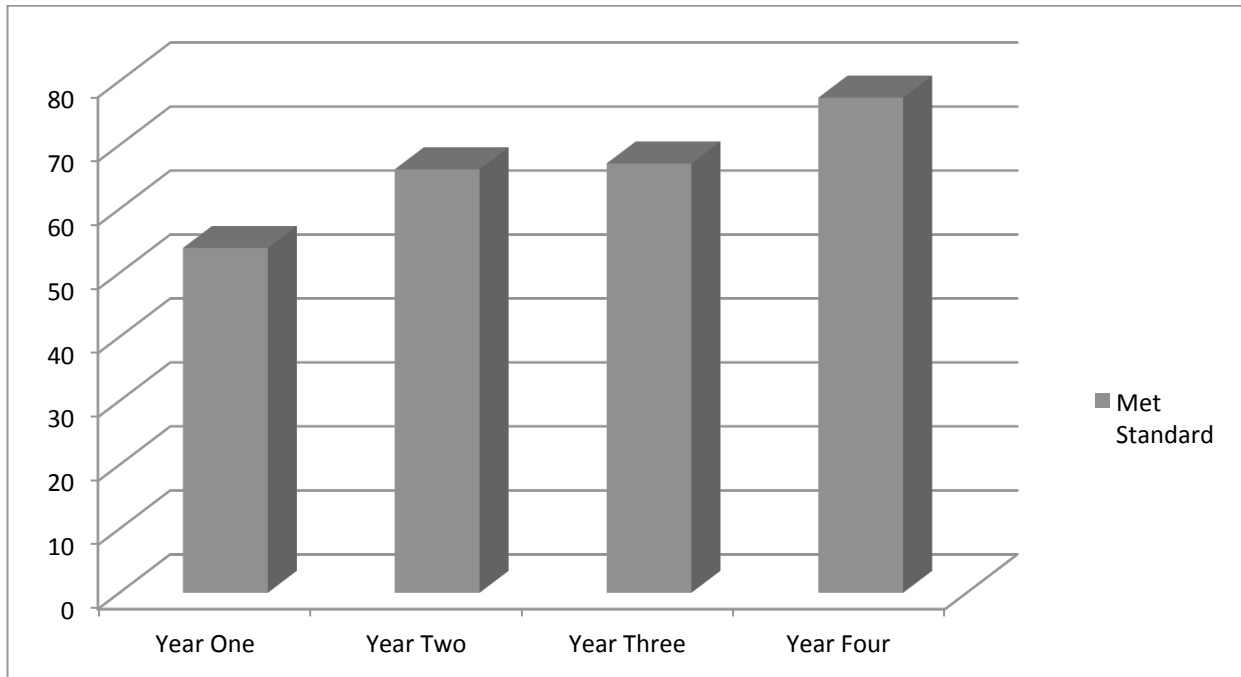


Figure 1. The percentage of students who Met Standard by year of Saxon Math instruction.

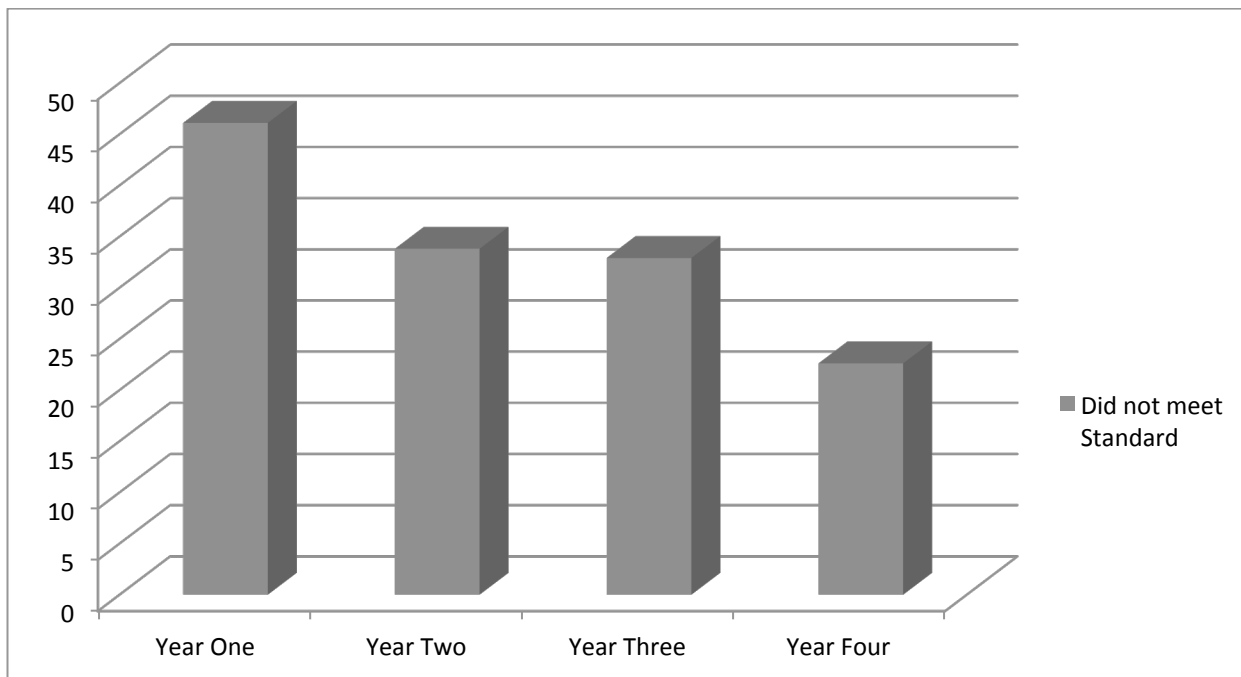


Figure 2. The percentage of students who did not reach Met Standard by year of Saxon Math instruction.

For the second research question concerning the relationship between Saxon Math instruction and students' Commended Performance assessment scores, the chi-square analysis resulted in a statistically significant difference, $\chi^2(3) = 10.09, p = .018$. The Cramer's *V* effect size for this result was .11, a small effect. As indicated in Table 2, the percent of students who achieved Commended Performance on the state math assessment after one year of Saxon Math instruction was 4.8% higher than the number of students who did not receive Saxon Math instruction. Consequently, 7.9% more students who received Saxon Math instruction for three years reached Commended Performance than did those students who received no Saxon Math instruction (see Figure 3).

Table 2

Numbers of Students and Percentages of Math Commended Performance and Did Not Meet Commended Performance as a Function of Saxon Math Instruction

Student Group	<i>n</i>	Did Meet Commended	Did Not Meet Commended
Year One Students	167	7.8%	92.2%
Year Two Students	198	12.6%	87.4%
Year Three Students	207	7.2%	92.8%
Year Four Students	217	15.7%	84.3%

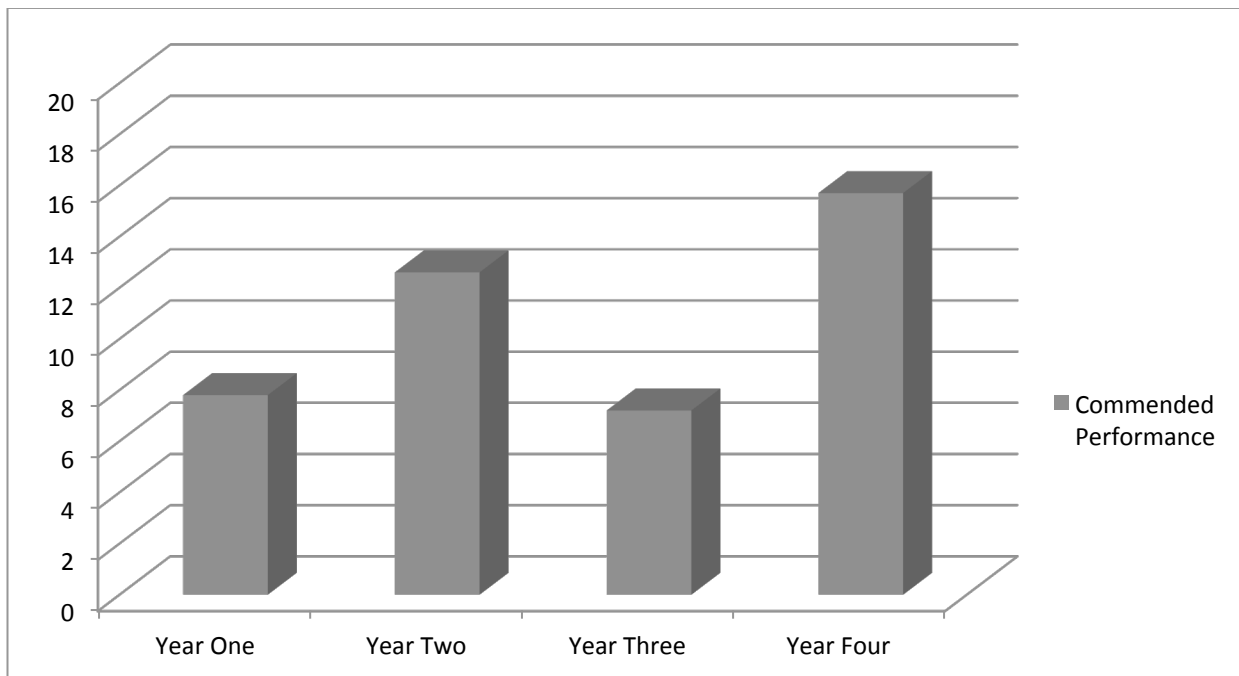


Figure 3. The percentage of students who met Commended Performance by year of Saxon Math instruction.

Notably, as delineated in Table 3, students who did not receive instruction in Saxon Math also did not meet the state assessment math standard or commended status as frequently as did their peers who received instruction in Saxon Math. Additionally, scores improved the more years of Saxon Math instruction students received. Not only did Met Standard scores improve with each year of additional instruction in Saxon Math, Commended Performance scores improved as well.

Table 3

Numbers of Students and Percentages of Math Met Standard and Commended Performance as a Function of Saxon Math Instruction

Student Group	<i>n</i>	Met Standard	Met Commended
Year One Students	167	53.9%	7.8%

Year Two Students	198	66.2%	12.6%
Year Three Students	207	67.1%	7.2%
Year Four Students	217	77.4%	15.7%

Discussion

A broad spectrum of math textbooks and curricula exists today. Much of the curricula in traditional textbooks employ a massed-practice approach in which practice problem sets associated with a particular lesson consist of several problems of the same type (Walsh, 2009). Saxon Math is a distinctly different curriculum than traditional math textbooks. Developed in the early 1980's by John Saxon, the Saxon approach to mathematic curriculum and instruction was based on the premise that students learn when instruction is incremental, when previously learned concepts can be continually reviewed, and when assessment occurs often and is cumulative (Resendez et al., 2005). The incremental method of learning was continued in the 2007 revised Saxon curricula.

The purpose of this study was to determine the effect of Saxon Math on student assessment scores, and, consequently, on students' understanding of mathematical concepts. Pertaining to the data from the school district in this study, evidence was present that Grade 8 students' achievement scores were affected by the Saxon Math program. Students with one year of Saxon math instruction reached Met Standard on the state assessment at a higher rate than did students who did not receive instruction in Saxon Math. Students with two and three years of Saxon Math instruction achieved Met Standard at higher rates than did the year one students. Similar results were evident with students achieving Commended Performance.

Although data from only one school district were analyzed in this research investigation, the study can be replicated to include data from across Texas and the United States. Analyzing data from a single school district in this investigation limits the generalizability of the study findings. The use of archival data also inhibited the ability to ascertain the fidelity with which the Saxon Math curriculum was implemented as well as the characteristics of the classrooms (e.g., climate, size, teacher skills).

The findings from this investigation were generally congruent with research studies (Resendez & Azin, 2008; Resendez et al., 2005; Resendez et al., 2007) conducted prior to the 2007 revision of the Saxon Math curricula. In these prior studies conducted in three different states, the Saxon Math curriculum had a positive outcome on math assessment scores in elementary and middle schools. Students instructed in the Saxon Math method showed significant growth in math performance on the TAAS from Grade 6 (1998) to Grade 8 (2001) and higher performance across all grade levels (2003-2004 sixth through eighth graders) on the TAKS (Resendez et al., 2005). Additionally, student achievement across student groups indicated a positive trend in math scores.

Many important questions remain to be answered in future studies of the revised Saxon Math curriculum: (a) What are the long-term effects of the revised Saxon Math on student performance?; (b) What effect does the revised Saxon Math curriculum have on the achievement gaps between student groups?; and (c) What differences are evident in academic performance between student groups as a function of Saxon Math? Until such questions are addressed, we encourage readers to view our results tentatively.

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Innovative Technology of Teaching Professional English At A Technical University In Russia

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ABSTRACT

This paper is a report on the findings of a study conducted at Samara state university of architecture and civil engineering, at the faculty of engineering economics. The research is devoted to interactive methods of English teaching. The author considers various interpretations of the concept “interactive methods”, analyses their effectiveness and develops own system of foreign language teaching, that is focused on the participation of all students in the speech process and chooses “team-building technology” as a core element of this system and as a type of interactive methods. This technology includes the complex of games in English. The results of the study prove that implementation of such games efficiently improves language level and develops professional skills of engineers—managers.

Keywords: engineering education, teaching system, foreign language, psychodrama approach, frame approach, “team-building” technology, games in English, corporate culture.

INTRODUCTION

Nowadays due to political, economical and social changes that take place in Russian Federation cultural and business interaction with other countries has considerably developed, and as a result, it influenced construction engineering and engineering education in general. Many enterprises and joint-venture companies demand high-technology developments, that have commercial value and meet the requirements of overseas customers.

Study of Russian and international requirements to the training of a qualified engineer show that professional competence of an engineer is determined not only by high professional level of knowledge, but also by the ability to interact in