# The Effect of the ALEKS Web-Based Learning System on Standardized Math Scores

An Action Research Project
Presented
to the
Shawnee Mission Board of Education

Vincent LaVergne

Shawnee Mission South

April 9, 2007

# Abstract

The purpose of this project was to determine if the use of the ALEKS Web-Based Learning System would have an impact on the standardized math scores of students in Algebra 1A. ALEKS is a program accessed online that serves as an interactive tutor for math students. All students in Algebra 1A spent two class periods per week working on ALEKS. The time spent on this program was in addition to the standard curriculum for Algebra 1A. Therefore, a student working on solving linear equations in class might be working on computation with fractions through ALEKS.

All Algebra 1A students are required to take the MAP Test (Measures of Academic Progress) two or three times per year. Specifically, Algebra 1A students took the MAP Test in September 2006 and again in January 2007. The result of this standardized test is called a RIT score. These RIT scores were used to calculate the average improvement for Algebra 1A students over that period of time. This average improvement was then compared to district and national averages for improvement in RIT scores.

Algebra 1A students using ALEKS (98 students total) had an average RIT improvement of 2.7 points. The district average for improvement over the same period of time was 1.0 points. The national average over that same period of time from the previous year (2005) was 1.6 points. Male students using ALEKS (58 males) improved their RIT score by an average of 2.6 points while female students (40 females) using ALEKS improved by an average of 2.8 points. Students using ALEKS for 31-60 minutes per week (83 students) and students using ALEKS for 61-90 minutes per week (15 students) both improved by an average of 2.7 points.

It seems that use of ALEKS within Algebra 1A had a significant positive impact standardized math scores. The improvement in RIT scores for students using ALEKS was much higher than the district and national averages. Both males and females benefited from the web-based learning program. The RIT improvement for students using the ALEKS for 31-60 minutes per week matched the improvement of those using the program for 61-90 minutes per week.

Based on data collected from the MAP Test in September 2006 and January 2007, the ALEKS program impacted students' standardized test scores.

# Original Proposal

**Purpose:** Some Algebra 1 math students have difficulty in a traditional classroom model with a traditional math textbook. The purpose of this project is to determine whether the ALEKS online math tutorial is an effective addition for helping students learn and retain math concepts and skills.

**Problem:** How does the ALEKS online math tutorial impact the learning and retention of math concepts and skills for Algebra 1 students as measured by the MAP Test (Measures of Academic Progress)?

**Review of Literature:**

**Professional Materials**


Becker, Henry. "Computer-Based Integrated Learning Systems in the Elementary and Middle Grades: A Critical Review and Synthesis of Evaluation Reports." Journal of Educational Computing Research 8(1)(1991): 1-41.

Cradler, John, et al. "How Does Technology Influence Student Learning." Learning and Leading with Technology May 2002: 46-56.

Kulik, James A. et al. "Meta-Analytic Studies of Findings on Computer-Based Instruction." Technology Assessment in Education and Training (1994): 9-33.

Schacter, John. "The Impact of Educational Technology on Student Achievement: What the Most Current Research Has to Say," Santa Monica, CA: The Milkin Exchange on Educational Technology, 1999.

Van Dusen, Lani M., and Blaine R. Worthen. "Can Integrated Instructional Technology Transform the Classroom?" Educational Leadership 53(2)(1995): 28-33.

Wenglinski, Harold, "Does it Compute? The Relationship Between Educational Technology and Students Achievement in Math," Princeton, NJ: Policy Information Center, Educational Testing Service, 1998.


**Internet**


www.aleks.com
www.wested.org/online_pubs/learning_return.pdf

**Summary of Review of Literature**

The ALEKS program fits into a category of software programs referred to as integrated learning systems (ILS). These systems were pioneered in the 1960's at Stanford University by Patrick Suppes. In 1994, after reviewing 16 studies of students using ILS for mathematics, Kulik found that test scores increased from the 50th to 65th percentile. These improvements were higher than those students not taught with the help of an ILS. In a 1991 study Becker found nearly identical results after reviewing the results of 32 studies looking at ILS effectiveness. Van Dusen and Worthen found that often schools using ILS are only implementing them 15-30% of the recommended time and that it is treated as a curricular extra instead of an essential piece of the curriculum.

In addition to scientific studies, there are numerous anecdotal stories of ALEKS helping students score higher within class and on standardized tests.

**Hypothesis:** By using the ALEKS online math tutorial within Algebra 1A twice per week, students will see an increase in MAP scores greater than the national average increase for students scoring at a similar level.

**Procedure:**

**Step 1**

Pretest all 9th and 10th grade Algebra 1A students on math concepts and skills through the MAP Test (six sections, approximately 150 students).
(September, 2006)

**Step 2**

Use the ALEKS online math tutorial with students twice per week to diagnose and remediate weak spots in student understanding and also to learn new math concepts and skills.
(Sept – May)

**Step 3**

Meet with the Algebra 1A teachers bi-weekly to discuss student progress and issues regarding the use of ALEKS and best management practices for classroom use of ALEKS. Adjust instructional strategies as needed.
(Sept – May)

**Step 4**

Administer a second MAP test to see the progress students have made. Compare student progress to the national average progress for students at that level during that period of time.
(Dec 2006/Jan 2007)

**Step 5**
Summarize and interpret data, formulate conclusion, design a future study, and share results with primary evaluator by April due date.

## Amendment to Original Proposal

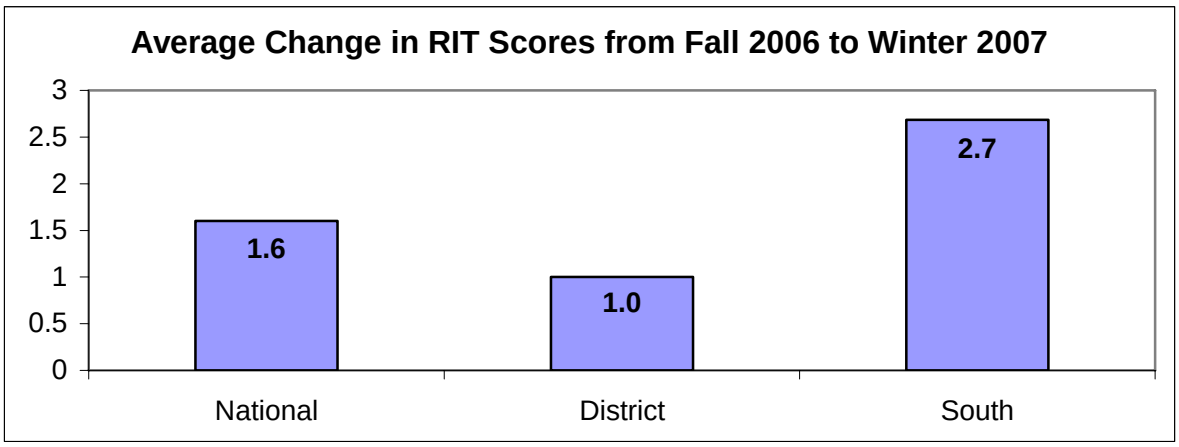
The original intent of the project was to include every student in Algebra 1A. After collecting all of the data, there were three categories of students excluded from the study. First, students who did not take the MAP Test in September and also January were excluded. It would not be possible to measure the improvement for these students. Second, the study was limited to $9^{th}$ grade students in Algebra 1A because there were 98 of them and only seven $10^{th}$ graders. Finally, students who spent less than 30 minutes per week on ALEKS were excluded. This requirement only affected two students.

# Data Interpretation

The Shawnee Mission School District has recently started using the MAP Test (Measures of Academic Progress) as a standardized measure of how students are performing. In fact, this test has replaced the ITEDs (Iowa Test of Educational Development) from past years. Students are able to take the MAP Test online two or three times each school year and get instant feedback. This allows students and teachers to see incremental gains in mathematics and also reading. The result of a MAP Test is called a RIT score.

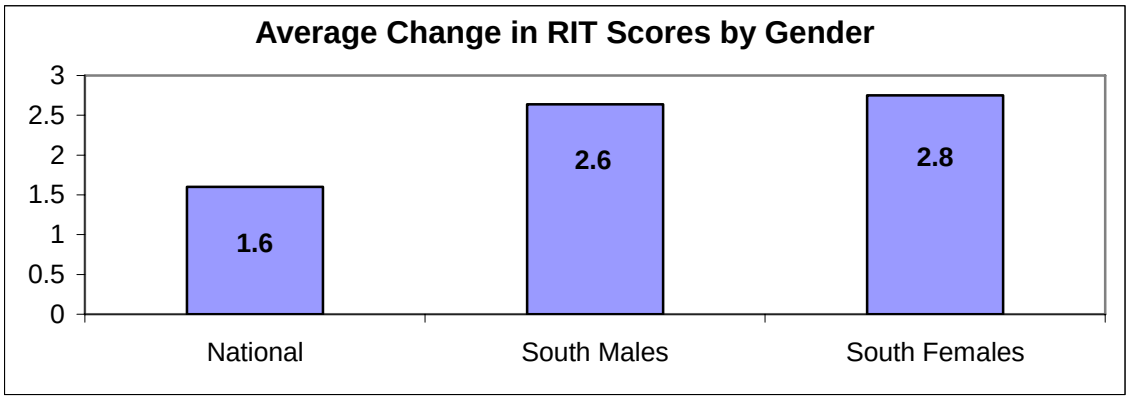
The MAP Test taken in September 2006 served as the pretest score for comparison with the MAP Test taken in January 2007. Between September and January, students spent two class periods each week using the ALEKS Web-Based Learning System within their Algebra 1A classes. These two scores were used to analyze that change in RIT scores for each individual student.

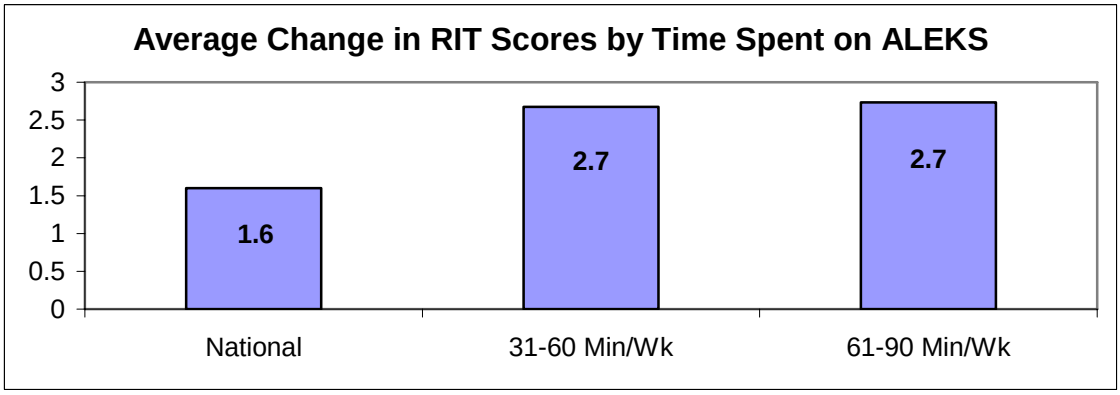
The following graph show the average improvement in RIT scores for 9th graders in Algebra 1A at SM South who used ALEKS for two class periods each week. This average improvement is compared to the national and district average improvement for all 9th graders over the same period of time. The national average is from the same period of time in 2005.




The average change in RIT scores for students at SM South (98 students) using ALEKS rose by 2.7 points whereas the national average change was 1.6 and the district average change was 1.0.

The following charts show the data disaggregated in various ways. The average change in RIT score is broken down by gender and by amount of time spent on ALEKS each week.




The data suggests that ALEKS had a similar impact on males (58 students) and females (40 students). The table also shows that using ALEKS for 31-60 minutes per week (83 students) had the same impact as using the program for 61-90 minutes per week (15 students).

The initial plan was to include all students in Algebra 1A in the study. Several groups of students were excluded. First, any student who did not take the MAP Test in both September and also January were excluded. Also, tenth graders were excluded from the study due to low numbers (7 students compared with 98 students in 9$^{th}$ grade). Finally, both students were excluded who did not spend at least 30 minutes per week on ALEKS

One additional question surfaced while looking at the effect of ALEKS on MAP scores. Both ALEKS and the MAP test are done online through a computer. It is possible that the students showed such dramatic improvement partially due to having significantly more practice with testing in a computer environment. It would be interesting to see if the results are similar when test scores from a paper-and-pencil test are used as the standardized measurement.

# Conclusion

Based on data collected on the use of the ALEKS Web-Based Learning System with Algebra 1A students, ALEKS had a significant impact on students' standardized math test scores. Students who used ALEKS two class periods per week showed a much larger gain on the MAP Test compared to the national average.

# Future

The use of ALEKS is an effective strategy for improving math scores on standardized tests with Algebra 1A students. SM South will continue to use this technique in the future to help those students.

This information will be shared with other math teachers in our building and also in our district. In addition, these results will be shown to building and district administrators who try to make informed decisions about spending money on programs such as ALEKS.

There are several future studies that could naturally flow from the results of this project. A study could be done to look at the impact of ALEKS on achievement for students in different math classes. Is the impact as significant for a student in $5^{th}$ grade, middle school, Algebra 2, Pre-Calculus, etc…? In addition, studies could be done looking at the impact of other web-based interactive programs on student achievement.