

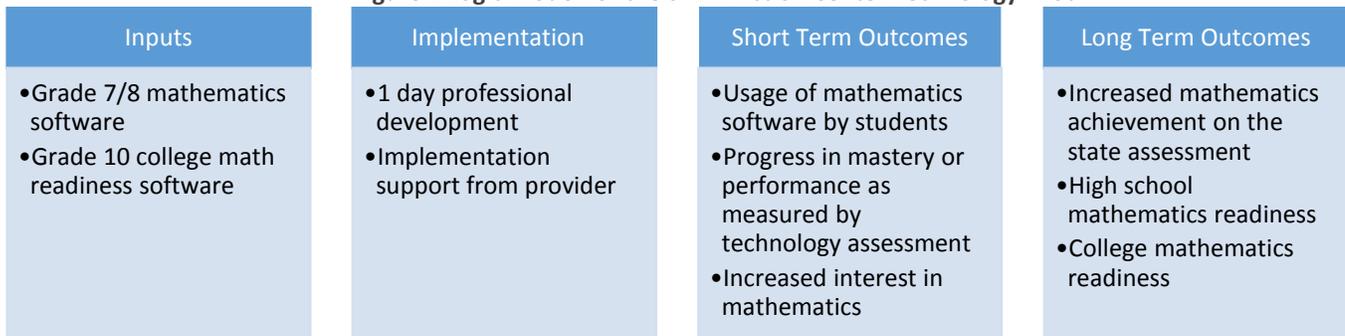
STEM Action Center Technology Pilot Assessment

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Overview of Assessment Preliminary Findings

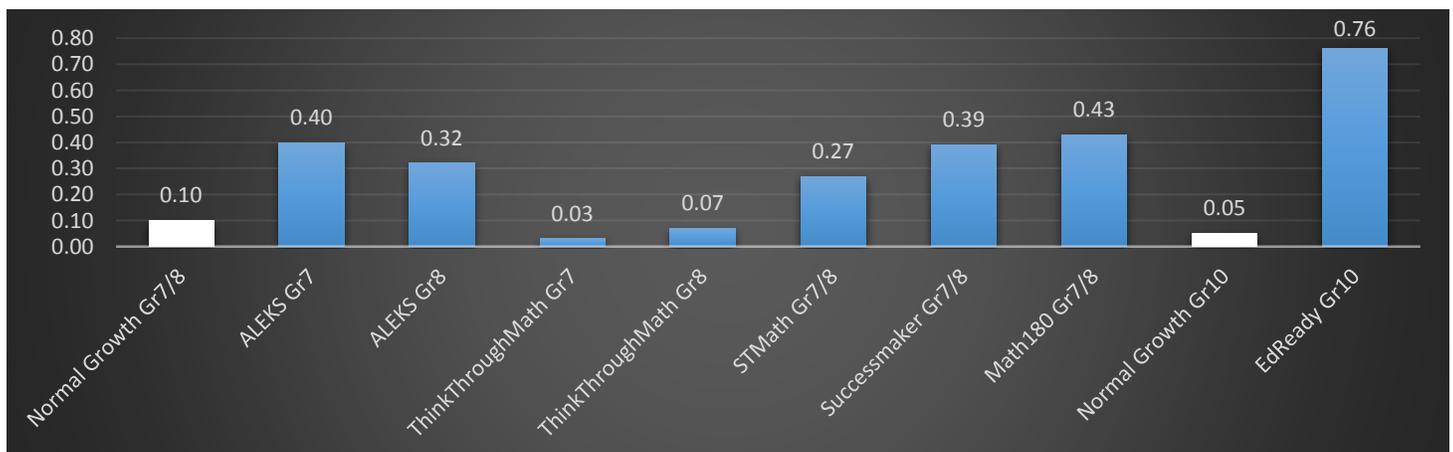
In the 2013 Utah Legislative session, HB 139 was passed which created the STEM Action Center for the State of Utah. This legislation also authorized a pilot program to begin in the 2013/14 school year. The pilot has two components. The first is to provide educational technology to support mathematics instruction for students in grades 6-8. The second is to prepare secondary students for college mathematics courses. The goal of this assessment is to determine the effectiveness of eight programs implemented in selected schools in Utah during the 2013/14 academic year and two programs implemented in during the 2012/13 academic year. For this report we present findings from the product assessments, which are short term outcomes of this project outlined in the logic model shown in Figure 1. The long term outcomes will be measured fall 2014.

Figure 1 Logic Model for the STEM Action Center Technology Pilot



Since each product had its own assessment with its own measurement scale, we standardized the difference between a student's pretest and posttest score, hereafter called a gain score, by creating a standardized mean difference called an *effect size*. The effect size was calculated by dividing the gain score by its standard deviation¹. Because the effect size for each product assessment is reported in standard deviation units, the effect size for each product assessment can be compared. When just looking at the gain score of students using the product it is important to compare their gain to an accepted benchmark² that represents the average gain score. This is expressed as an effect size that would occur under normal school year conditions and without attributing this gain to an intervention. For grade 7 and 8, a student's annual mathematics growth is an effect size of 0.32 standard deviation units, which is about 0.032 units per month. For grade 10 students, annual mathematics growth is normally 0.15; which is 0.015 per month. For the 3 month period of the pilot, we would expect a natural growth of 0.10 for grade 7/8 and 0.05 for grade 10. The graph in Figure 2 demonstrates the effect size of the gain made in student mathematics performance by product.

Figure 2 Effect Size of Gain in Mathematics Performance Compared to Natural Growth for 3 months of pilot



In only three months, grade 7/8 students **using ALEKS, Successmaker, and Math 180 made as much progress as is normally expected in an entire academic year**; students using **ST Math improved almost three times as would be expected**. Grade 10 students using **EdReady made five times the progress expected in an entire academic year** with just 3 months of use. The results for Think Through Math are confounded by the fact that their outcome measure is a single digit grade level measure; therefore, it lacks the potential for variability that is needed to detect change in such a short period of time. Due to positive teacher and student responses to use of Think Through Math, it is important to wait to draw conclusions about its effectiveness until the state assessment results are available.

The gains made by students using these products may not be completely related to the products, but may relate to other factors. A Cluster Randomized Control Trial design is the least biased method of determining the effectiveness of a product and is recommended when desiring information to inform policy or large scale implementation across a state. For every product we worked with schools to see if they would be willing to randomly assign teachers (or class sections) to either intervention or control. We were able to collect data for three products using a randomized control trial: ALEKS, Think Through Math, and Successmaker. Using this data, we conducted an analysis called Hierarchical Linear Modeling that accounts for students being clustered in classes in a school to determine if there was a statistically significant difference between mathematics gains made by students using the product and students not using the product (control group). **ALEKS was the only product where a statistically significant difference ($p < .01$) was found** where students using the product outperformed students not using the product. At the end of the academic year, we will be analyzing student achievement on the state assessment to compare effectiveness across products using the same outcome measure.

There were two new products already in use in Utah, hypothesized to improve student mathematics achievement: ConnectED (McGraw-Hill) and MATHia (Carnegie Learning). We assessed the effect of these products on grade 7/8 mathematics achievement on the state assessment spring of 2013. There were 1,652 grade 7 and 1,710 grade 8 students using MATHia, 7,420 grade 7 and 7,338 grade 8 students using ConnectEd. Using data for the entire state we compared the performance of students using the products to the performance of students not using the products (36,519 grade 7 and 35,399 grade 8 students) using Hierarchical Linear Modeling with covariate adjustment. This method controlled for differences between students in prior year math achievement (baseline measure) and differences in student characteristics, school characteristics, and locale (e.g. rural). This design is the next best approach, if random assignment is not possible and when there is a small number of schools using the product. **Statistically significant differences ($p < .05$) were found for ConnectED and MATHia products for grade 8; students using the products outperformed students not using the products.** A positive difference was found for grade 7 students using these products, but the difference was not large enough to be statistically significant.

There are several additional steps we are taking to assess this pilot. We are looking at usage data for each product to understand the diversity of use within each school and across schools for each product. This will include usage data for STEM Academy and Defined STEM, products that did not have a student assessment component. We are also analyzing data collected on changes in student engagement and interest in mathematics that may be related to use of these technology products. It is hypothesized that use of technology products may be one way to increase student beliefs about their own ability to do mathematics and their interest in pursuing a STEM career in the future. Finally, we are summarizing teacher feedback from monthly surveys by product to understand the satisfaction and concerns they have with each product.

Summary of Findings:

Students in the pilot (Oct-Dec 2103) using ALEKS, ST Math, Math 180, Successmaker and EdReady made more progress in mathematics than would be expected under normal conditions.

Students using ALEKS significantly outperformed students in a control group.

Students using ConnectEd or MATHia significantly outperformed similar students in the state without access to these products in 2012/13.

This pilot would not have been possible without the generous donation of these product providers (number of user accounts):

- ALEKS®, ALEKS Corporation (1,739 students)
- ST Math®, MIND Research Institute (1,334 students)
- Think Through Math, Think Through Learning Inc. (1,334 students)
- SuccessMaker®, Pearson Education (765 students)
- Math 180, Scholastic (already in use with 82 students)
- The STEM Academy®, The STEM Academy Inc. (14 schools)
- EdReady, Monterey Institute for Technology and Education (206 students)

Notes

1. Calculation of effect size used is (gain score)/[standard deviation of the gain score/(square root of 2 times 1-r, the correlation between pretest and posttest)] from Wilson, D. B. (2001). Practical meta-analysis (Vol. 49). Sage.
2. Annual achievement gains under normal conditions taken from page 28 of Lipsey, M.W., Puzio, K., Yun, C., Hebert, M.A., Steinka-Fry, K., Cole, M.W., Roberts, M., Anthony, K.S., Busick, M.D. (2012). Translating the Statistical Representation of the Effects of Education Interventions into More Readily Interpretable Forms. (NCSER 2013-3000). Washington, DC: National Center for Special Education Research, Institute of Education Sciences, U.S. Department of Education

If you have questions about this summary please contact Dr. Sarah Brasiel, sarah.brasiel@usu.edu