Results from the DreamBox Learning Grade 2 Assessment Study:
Math Achievement Test Demonstrates 19% Increase

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Overview:

The purpose of this independent research was to determine if students who participated in the DreamBox Learning K-2 Math instructional program demonstrated increased achievement on traditional paper-and-pencil assessments. At the core of this research question is whether or not innovative game-like instruction can impact a student's performance on tests given within the context of school-like accountability assessments required under *No Child Left Behind*.

This study focused on second grade students who volunteered to participate in a pilot implementation of the DreamBox Learning instructional product, DreamBox Learning K-2 Math. Twenty-seven second grade students participated in a study to examine the effectiveness of the DreamBox technology on mathematics learning over a two-week period. Students were given a paper-and-pencil pretest on the first day of the DreamBox after-school program. They were then given a parallel post-test on the last day of the DreamBox after-school program. The results were analyzed using a paired-sample or dependent t test and the results were found to be statistically significant with an average improvement in test scores.

This sample achieved a 19% increase in average score on the assessment after only an average of 4 hours of incremental instruction. These findings indicate that learning gained by using the DreamBox Learning K-2 Math product does transfer to school-like assessments even after relatively brief amounts of engagement.

Research Methodology:

There are internal embedded assessments in the DreamBox Learning K-2 Mathematics product that are discussed in a separate research study. This research focused on changes in achievement as measured through independent assessments − not part of the DreamBox Learning program and not developed by the DreamBox Learning instructional team. This research examined changes in achievement as demonstrated on paper-and-pencil tests comparable to those achievement tests used for accountability purposes under *No Child Left Behind* (NCLB). These paper-and-pencil tests were developed by assessments experts who had no visibility to the current DreamBox Learning technology. Using the list of content objectives provided by the DreamBox Learning instructional team, two parallel forms of twenty items each were developed. The assessment professionals who developed these tests have over twenty years of developing mathematics accountability tests for states such as California, Florida, Massachusetts, Virginia, and Texas. The reliabilities of both of these forms exceeded .85 (Cronbach's Alpha).

The test blueprint focused on number sense and operations consistent with the instructional content of DreamBox Learning K-2 Math. The tests were all multiple-choice and included two story problems per form (pre and post). DreamBox curriculum experts reviewed the items for alignment to the content standards addressed by DreamBox learning K-2 Math. These content standards are consistent with the National Council of Teachers of Mathematics *Focal Points* for Grade 2 (which is published on the NCTM website.)[i]

Students were recruited for this study from public schools in the Bellevue, Washington area where DreamBox Learning is based. This was a volunteer sample of 2nd grade students, nominated by their parents for participation in this research. The research program was conducted after school and/or at home

for an hour a day for no more than ten hours. Twenty-seven students took both the pre-test and the post-test. These were the students included in the analysis.

Research Findings:

Of the twenty-seven students who participated, 15 were females and 12 were males. No independent analyses were conducted by gender because of the small samples.

The average (mean) pretest for the group was 10.57 out of 20 points possible. The standard deviation for the pre-test was 3.95. The mean for the post-test was 12.54 with a standard deviation of 4.09.

Using a paired-sample (or dependent) t-test, the improvement in test scores (positive difference between pre and post test performance) for this group of second grade students was significant at the $p<.05$ level.[ii]

Grade 2 Pre-test / Post-test Mean

Pre-Test	Post-Test
10.57	12.54
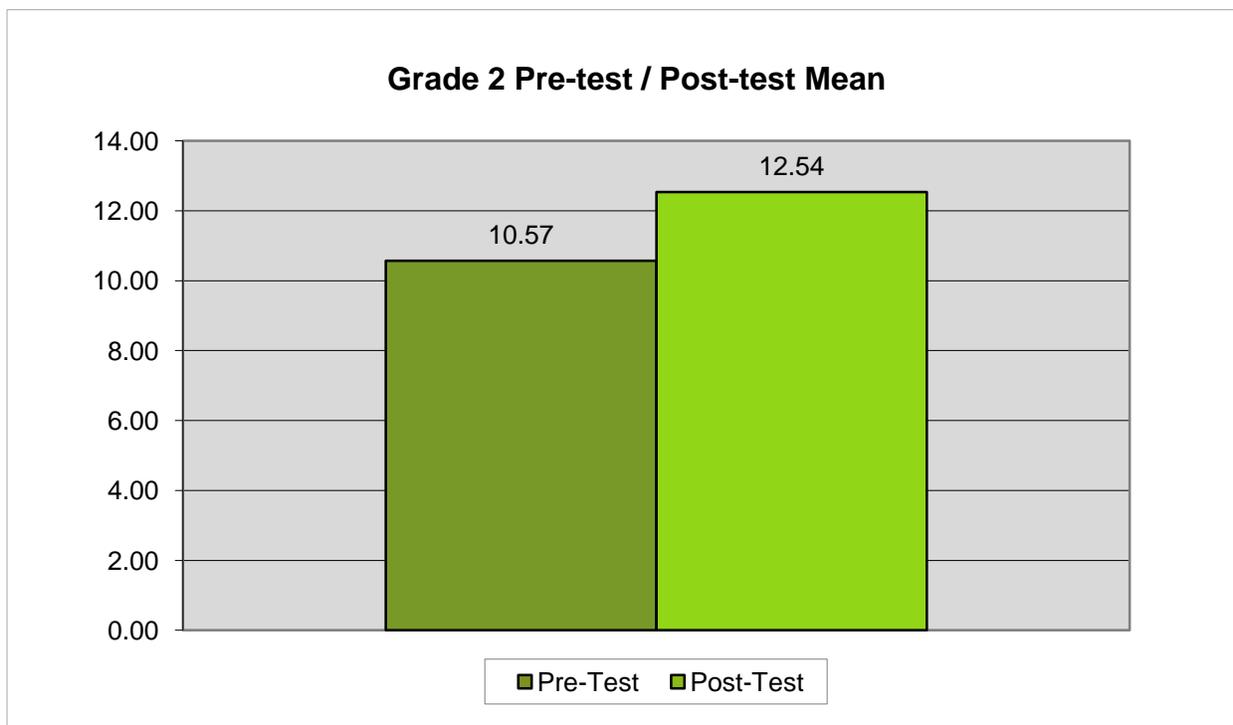
Of the total ten hours, two hours were used for the pre-and post-assessment administration, and approximately one hour for daily attendance, snack time, and talking with the teachers who were monitoring the classrooms. During the remaining 7 hours, approximately three hours were used logged into the technology tool but not actively engaged in learning. During these three hours, students were exploring the technology, selecting an avatar, and playing games within the technology. Students were engaged in learning activities specifically for an average of 4 hours over the two-week pilot study.

The improvement in test scores results were achieved after an average of 4hours total engaged in the instructional components of DreamBox Learning K-2 Math. Another way to report this is that there was a 19% increase in average score on the assessment after only an average of 4 hours of incremental instruction.

Using regression to determine the incremental improvement on total test scores given one hour in the DreamBox instructional technology indicates that, on the average, a student's score is likely to improve by approximately .4 points.

Conclusions and Implications:

The findings from this independent research study are interesting from two perspectives. First, children as young as second grade (7 years old) can learn from a game-like mathematics program and then transfer that learning to a traditional school-like paper-and-pencil test. Students were able to answer correctly both computational questions and traditional story problems where the mathematics is contextualized. Story problems are traditionally more difficult than straight computation. Yet, these data indicated that the story problems did not pose any more difficult a challenge to these students than the computational questions. This is particularly interesting because the DreamBox Learning K-2 Math product does not directly present traditional story problems. However, all instruction within the DreamBox product is contextualized or set in stories. Additional research should be conducted to examine the relationship between the contextualized mathematics experience students have in the DreamBox K-2 Math product and their ability to engage with and correctly answer traditional story problems in school-like contexts. This is impressive.

Second, the amount of time spent that resulted in significantly higher test scores was relatively small (approximately 4 hours).

Further research will be needed to confirm the findings reported here and expanded to other grades as the product itself expands to support learning above K-2. Emphases should be placed on achievement improvement given specific amounts of exposure to the DreamBox product and to the transfer of that learning to school settings and real-world applications. In addition, as more data is collected, research should examine any possible difference in effect by gender.

About the author: Dr. Margaret Jorgensen

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For more than 30 years, Dr. Jorgensen has been a leading authority on assessment for K-12 education. As managing director at Battelle for Kids, a non-profit enterprise focusing on educational reform, she oversees the organization's communications and research on value-added and growth models for effective instructional practice; and research on achievement measures and non-cognitive measures.

Previously she was CEO of Measure2Learn, LLC, consulting with Teach for America (supporting development of assessment quality strategy); Data Recognition Corporation (online K-12 formative and summative assessment initiatives); Pearson VUE- NCLEX project; SAM Learning; and Princeton Review's K-12 division, now Core K12 Education.

Dr. Jorgensen is a former Senior Vice President for Product Research and Innovation at Harcourt Assessment. She is also on the Board of the Association of Test Publishers. Dr. Jorgensen earned her

Ph.D. in Measurement, Evaluation, and Statistical Analysis from the University of Chicago and holds a Masters of Science in School Psychology. She is the author of two books on innovative assessment and has developed hundreds of criterion-referenced, standards-based, and norm-referenced tests for K-12. Dr. Jorgensen is also an advisor to DreamBox Learning.

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[i] http://www.nctm.org/standards/focalpoints.aspx?id=326
[ii] This level of significance is commonly used in educational research and indicates that the probability of the significant differences being due to chance alone is less than 5 percent.

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