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Effectiveness of the *Math Snacks* Learning Intervention Research Summary

Students engaged in *Math Snacks* in class **learned more math** than those with access to just classroom instruction.

Mathematics educators, mathematicians, learning specialists and game developers collaborated to develop and test **five games, six animations** and **related support tools**. *Math Snacks* are grounded in theory-based pedagogy that support the construction, not just the transmission, of knowledge. Accompanying **teacher guides, learner guides, "Teaching With" videos**, and correlations to the Common Core reflect an inquiry-based and constructivist approach.

Math Learning Tools Based in Research

Research was a driving factor throughout the development of *Math Snacks* materials, including investigations into learners' needs, extensive user testing, and classroom observations. Before developing the intervention, researchers at New Mexico State University examined over 20,000 standards-based test results for K–8 students in four different districts to determine gaps in conceptual understanding, paying special attention to open-ended questions. They also conducted more than 500 hours of classroom observations to explore and confirm the identified gaps, clarifying why students misunderstood the questions they did. Middle school math students showed the greatest learning gaps in the areas of **fractions, decimals, ratio/proportion, and number sense**.

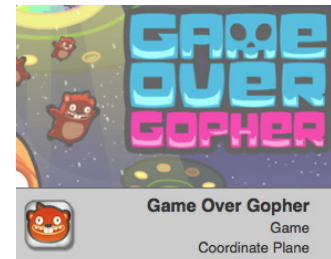
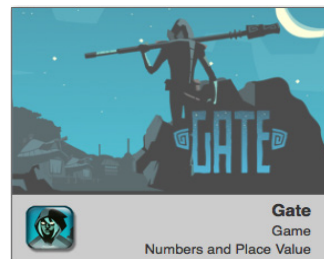
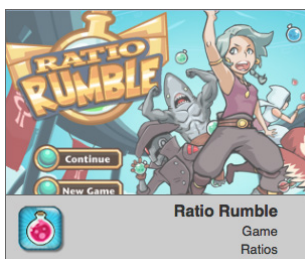


An educator and a student work together on a hands-on activity tied to one of the *Math Snacks* modules.

Pilot Research

Pilot Studies

- In one low-income, urban school district, 9 middle school teachers in 3 schools used the animations and related activities. Their students showed significant learning gains, particularly of concepts.
- In a randomized controlled study with the students of 38 sixth grade teachers and 2 seventh grade teachers from 9 districts, students showed gains in understanding ratio and number line concepts when taught with *Math Snacks* materials, slightly higher than students who did not use *Math Snacks* materials.



Large-Scale Randomized Control Study

Randomized Control Trial on Use of Games

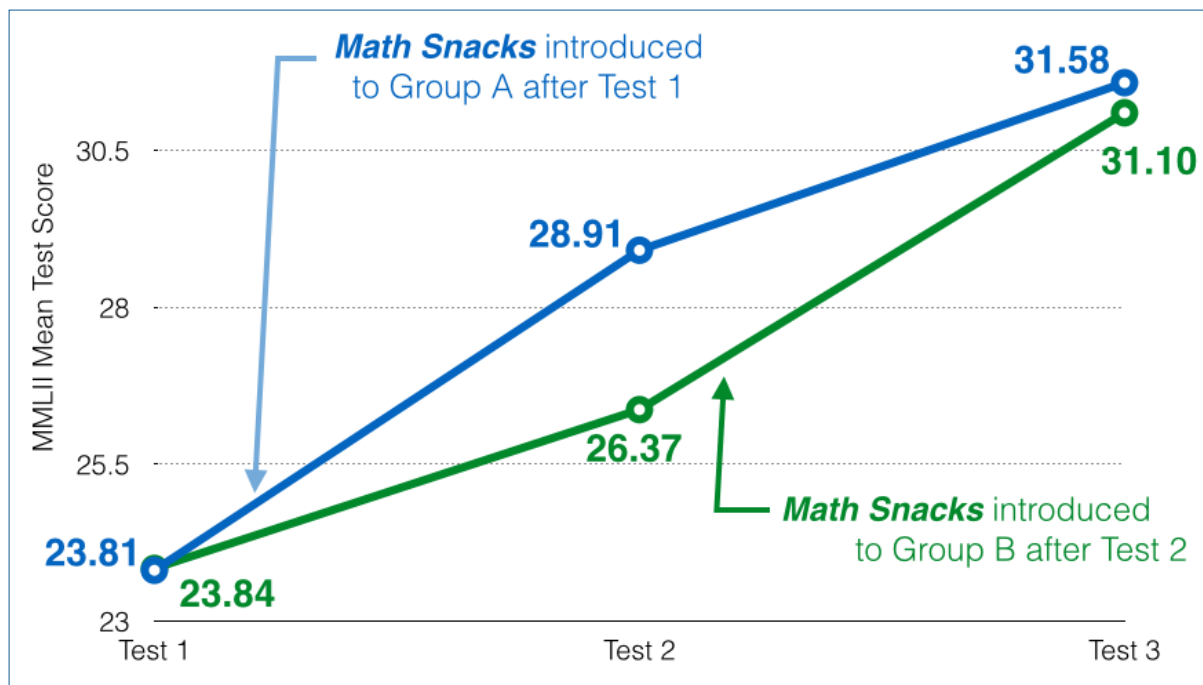
Classes were randomly assigned to two groups. All students took the first test. Teachers in Group A used *Math Snacks* and activities with their district-approved curriculum, and teachers in Group B only used the district-approved curriculum. All students took the second test. Teachers in Group B then integrated *Math Snacks* into instruction.



An educator and a student work together on a hands-on activity tied to one of the *Math Snacks* modules.

Fifth Grade Learners showed **significant gains** after receiving the *Math Snacks* intervention, regardless of *when* they were granted access.

Learning gains of fifth-grade students (n=741)



Group A, who received the *Math Snacks* intervention, **showed significant learning gains** compared to Group B (Test 2) who received *only the district curriculum*. Once learners in Group B also received the intervention in the second five weeks, they **subsequently caught up** with Group A (Test 3). The test used was the Measure of Mathematics Learning II (MMLII), developed by researchers to measure conceptual understanding of the coordinate plan, ratio and place value.



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