Tackling the 2 Sigma Problem: Effective Personalization in K-12 Mathematics

What is the 2 Sigma Problem and Why Does it Matter?

In 1984, educational psychologist Benjamin Bloom found that students who receive one-on-one tutoring perform two standard deviations better than students who learn in conventional scenarios—a single teacher and a group of students, for example. The two standard deviations are the "2 Sigma" referred to in the 2 Sigma Problem. **In essence, the average tutored student outperformed 98% of his or her peers who did not receive tutoring.**

But What is the "Problem"?

Even though Bloom's research and subsequent studies found that students perform significantly better when given one-on-one tutoring, Bloom also observed that providing individual tutors for every single student isn't realistic.

This is the "problem" in the 2 Sigma Problem. We know that tutoring students improves their achievement, but we also know that schools and districts can't afford to provide every student with his or her own personal tutor for every subject.

The Achievement Gap

The 2 Sigma Problem can help us understand one simple cause of the achievement gap. Because students in more affluent communities have access to one-on-one tutoring, they have resources that can help them outperform the vast majority of students who don't receive tutoring.

So the question then becomes, how can we tackle the 2 Sigma Problem and help to close the achievement gap?

How LearnBop Addresses This Challenge

When LearnBop—an automated math tutoring system for K-12 students—was first developed, this was the primary question we wanted to address: How can the benefits of one-on-one tutoring

be replicated in a cost-effective manner to give students everywhere access to the same resources?

When designing LearnBop, math educators who had spent an average of 30 years in the classroom each were asked how they would go about tutoring a student who ran into trouble with a particular problem or concept. Unanimously, they answered that they would guide the student step-by-step through the prerequisite concepts needed to understand the problem originally attempted.

The reason for guiding students step-by-step is that math learning is scaffolded, meaning that each concept builds on prior concepts. If a student doesn't understand a particular problem, it's likely he or she missed a key concept in an earlier lesson.

The best way to help students move forward is to go back over the prerequisite concepts needed to understand the concept currently being studied and help the student master them. Through this tactic, students obtain the strong foundation needed to learn new concepts and address prior knowledge gaps, leading to improved mastery in mathematics.

The Step-by-Step Approach

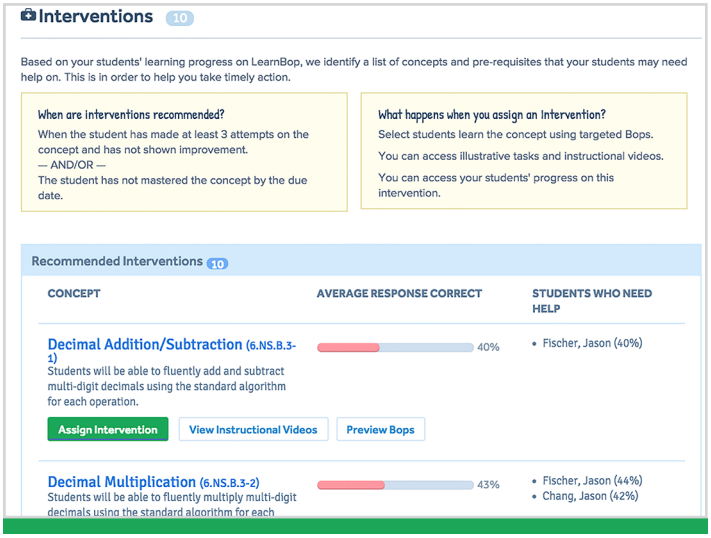
Based on this input from master teachers, LearnBop was created as a step-by-step automated tutoring system with content for K-12 students. Every step in LearnBop's math learning system addresses a prerequisite concept needed to understand the problem originally attempted, providing students with close support in learning prior concepts.

The Power of In-Depth Data

Personal tutors observe a student's performance and recommend additional practice to address students' most challenging concepts. This is why every step in LearnBop is tagged with a mathematical concept, allowing teachers to gain in-depth data showing them exactly what each student needs to master to move forward.

LearnBop automatically analyzes student data and groups students according to their needs, allowing teachers to assign interventions with a click of a button. In this way, students gain the same benefits they would receive from one-on-one tutoring in a manner that saves teachers time and helps personalizes instruction for all students.

Interventions at the Click of a Button



This Sounds Great, but Does It Work?

Yes! A recent efficacy study by research group SEG Measurement found that LearnBop helped students achieve significantly higher learning gains than their peers. Students in the study were divided into two groups, with one using LearnBop and the other not using LearnBop. All participants were given a pre-assessment at the beginning of the study.

After 16 weeks of instruction students were given a post-assessment to evaluate how much their math knowledge had increased.

Did You Know? The "BOP" in LearnBop stands for Behavior Optimization Protocol, which refers to the unique interactive learning experience used in every one of LearnBop's math problems.

The Results

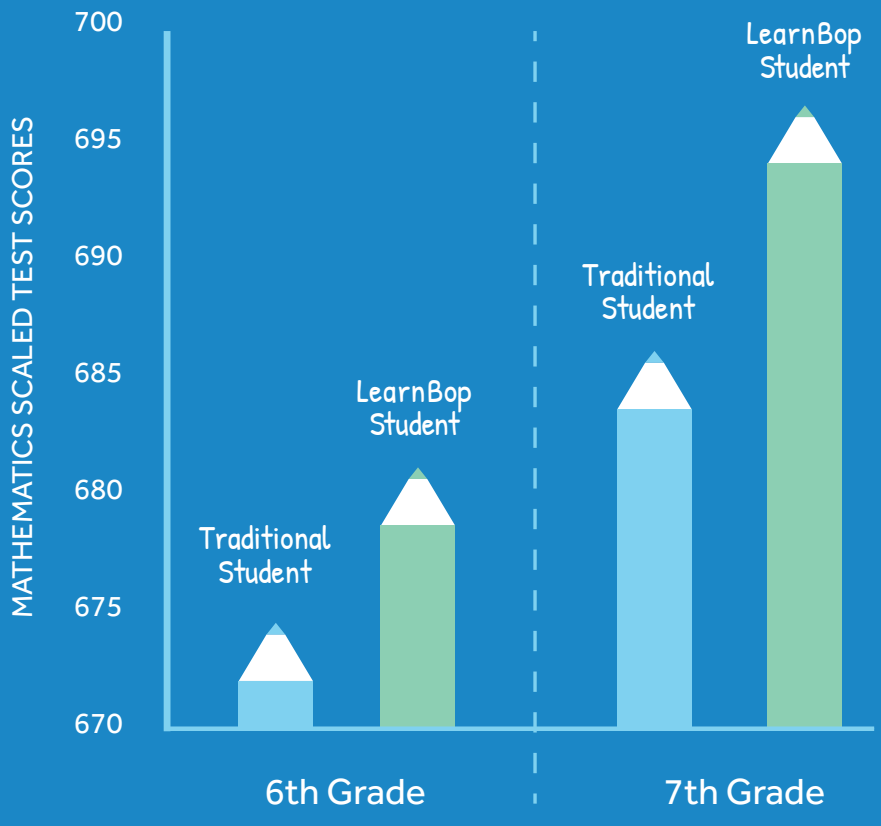
In just one hour of use a week, students who used LearnBop achieved **7-9 percentile points** more growth on post-assessments than their peers. As compared to national averages, students who used LearnBop achieved **40-66% more growth than other students** of the same age. These results demonstrate that LearnBop's approach to solving the 2 Sigma Problem is working to boost math mastery for young learners.

How Do Math Teachers Use LearnBop?

Many teachers use LearnBop as practice for students after teaching a new concept. Because LearnBop acts like a tutor, walking students through prerequisites and gathering data on individual knowledge gaps, teachers can move forward in their syllabus with confidence, knowing that each student is getting the personal support they need to reach their full potential.

"Because every step is tagged with a specific math standard, vital data is collected while students learn."

–Dr. Charlene Marchese
District Supervisor of Mathematics, Freehold Township School District, NJ



Want to learn more about how you can help your students achieve these results?

Schedule a demo now or sign up for a free trial to see how LearnBop boosts students' performance in mathematics.

learnbop.com/demo