Math Shelf Impact

Math Shelf has been proven to increase student achievement in two peer-reviewed randomized controlled trials, and one peer-reviewed quasi-experimental study to outperform both in-class teaching, other leading digital early math programs, and research-based math curricula. Math Shelf is focused on reaching underserved students, and its research base reflects this. Two of the three studies were conducted in low-income schools (one Head Start network and one publicly funded preschool organization). All three research studies included primarily Black and Latinx populations. While effect sizes were uniformly impressive (ranging from 0.57 to 1.53; 6 months to 15 months more learning than controls), variation may be due to differences control group treatment and study duration. Of particular interest are the findings that initially low performing and minority students made the greatest learning gains in Math Shelf. The following table provides a summary of Math Shelf's empirical results:

Table 1. Math Shelf Study Results

Publication	Description	Demographics	Effect size		
			All	Non-white	Low pre-test
Early Education and Development (2014)	**Schools:** Head Start **Method:** RCT **Control group:** Leading 2014 early math apps **Sample:** 100: **Length:** 6 weeks	**Avg. age:** 4yr 2 m **SES:** Low-income **Race:** 50% Latinx, 40% black, 9% white, 1% other	0.57	--	--
Computers in Human Behavior (2015)	**Schools:** Public preschool **Method**: quasi-experimental **Control group:** Existing math curriculum **Sample:** 227: **Length:** 16 weeks	**Avg. age:** 4yr 5 m **SES:** Low-income **Race:** 80% Latinx, 16% black, 4% white	1.09	--	1.53
Mathematics Education Research Journal (2016)	**Schools:** Catholic diocese preschools **Method:** RCT **Control group:** Research-based math curriculum **Sample:** 433: **Length:** 22 weeks	**Avg. age:** 4yr 6 m **SES:** mixed **Race:** 50% Latinx, 40% black, 6% white, 4% other	0.94	1.19	1.27

When comparing Math Shelf to other early math programs, Math Shelf produces **3x the learning**, and requires that children only play twice a week for 10 minutes each session. Most critically, Math Shelf is easy to implement and requires minimal teacher supervision to achieve maximum results (Figure 1).

The Problem Math Shelf Is Addressing

Research shows that early math skills are critical for a child's long-term success in school and life. However, the majority of low-income children start kindergarten unready to learn age-appropriate math. On average, these students are a year behind their peers in math achievement when they enter kindergarten, and this gap widens to 2.5 years by fifth grade.[1]

A major driver of the early math achievement gap is a lack of consistent high-quality math education in preschool and Kindergarten classrooms. Multiple surveys have found that preschool and Kindergarten teachers are uncomfortable teaching math, and devote much more time teaching reading.[2] Relatedly, there are few proven early math solutions; the Department of Education's "What Works Clearinghouse" identifies only two evidence-based early math curricula[3], and no digital early math programs.

Introduction to Math Shelf

Math Shelf is a tablet-based preschool and Kindergarten mathematics program that provides over 1,500 sequenced instructional games and activities rooted in Montessori instructional approach. The curriculum is accessible to children as young as three, covers math topics halfway through first grade, and is aligned in

[1] Isaacs, J. B., Starting School at a Disadvantage: The School Readiness of Poor Children, Washington, DC: Center on Children and Families at the Brookings Institution (March 19, 2012). Retrieved from https://www.brookings.edu; National Research Council. (2009). Mathematics learning in early childhood: paths toward excellence and equity. Washington: National Academies Press.

[2] Jordan, N. C., & Levine, S. C. (2009). Socioeconomic variation, number competence, and mathematics learning difficulties in young children. Developmental Disabilities Research Reviews, 15, 60–68; Schacter, J., & Jo, B. Improving preschoolers' mathematics achievement with tablets: a randomized control trial. Mathematics Education Research Journal. 2017; 1-15.

[3] What Works Clearinghouse

math content and structure to preschool math learning frameworks, the Kindergarten Common Core Math Standards, DRDP COG Math, the Head Start Early Learning Outcomes Framework (Mathematics), and Teaching Strategies Gold.

Math Shelf's core pedagogical elements draw from the following research-based best practices:

- *Developmental Math Progressions:* Math Shelf incorporates developmental math learning trajectories for: Counting, Subitizing, Ordering Numbers and Collections, Comparing Numbers, Addition and Subtraction, Place Value, Spatial Thinking, Geometry, and Measurement.
- *Mastery & Montessori Learning*: Math Shelf's instructional approach combines mastery learning, and Montessori's mathematics materials, teaching methods, and instructional sequence.
- *Individualized learning*: Math Shelf uses an initial Placement Test to find the right starting point for each child based on his/her knowledge, and builds a learning plan bespoke to the child's starting point and pace of progress.

Today, Math Shelf reaches 1,350 classrooms and approximately 30,000 students, largely through word of mouth and progression through networks. As further evidence of user demand, Math Shelf has seen an annual renewal rate of 80 percent, and a sales compound annual growth rate of 200 percent. The Math Shelf app can be downloaded from the Apple, Amazon, and Android app stores. A classroom license cost $499 per year.

Figure 1. Math Shelf User Interface and Reports