

Executive Summary: Strengthening Executive Function Skills to Improve Mathematics Learning

Evidence of Promise from EF+Math's Inclusive R&D Approach



Executive Summary

Students, teachers, and schools are in urgent need of bold, rigorous mathematics learning approaches that are developed and tested in real classrooms—and are proven to get results.

Education experiences that are equity centered, based on learning science, and co-designed by educators, researchers, and developers have the promise of dramatically improving mathematics outcomes for Black and Latinx students and students of all races experiencing poverty.

At EF+Math, we are working to understand the promise of mathematics learning approaches in grades 3–8, co-designed with students and teachers, that combine executive function (EF) skills, conceptual understanding and multi-step problem solving, and equity. EF+Math has early evidence that shows the positive impact of this unique approach.

The EF+Math insights report shares promising preliminary findings from EF+Math’s portfolio of 10 teams, each made up of students, educators, researchers, and developers who **collaborate through a unique Inclusive Research and Development (R&D) approach**. Our Inclusive R&D model places an intentional focus on equity throughout the R&D process and, from the start, centers educators and students as crucial partners working alongside researchers and developers throughout cycles of design and research. These teams are in the third year of a five-year R&D cycle to design, build, pilot, and evaluate mathematics learning approaches and new research tools. The full report shares insights from what teams have learned so far.



Executive function skills are the core capacities that allow us to manage our attention, thoughts, emotions, and behavior. EF skills include three separate and interacting processes:

- + **Cognitive Flexibility** refers to shifting one’s attention between multiple tasks or perspectives.
- + **Working Memory** involves holding and working with information in one’s mind.
- + **Inhibitory Control** means the ability to focus on the information that is important and ignore distractions (Miyake et al., 2000).

Our Insights

After many iterations of R&D in co-leadership with educators and students, EF+Math project teams have developed novel mathematics learning approaches and begun testing their scientific hypotheses about the relationship between EF and mathematics through pilot studies in classrooms across the country. Below are insights from the work as a whole portfolio based on teams' early results.

- + EF+Math approaches show promise for improving student learning.** Evidence from teams that have conducted early implementation studies shows the positive impact of approaches that simultaneously build EF and mathematical skills and are designed through our Inclusive R&D process explicitly for Black and Latinx students and students of all races experiencing poverty.
- + When educators and students are involved at every stage of the R&D process, learning approaches are more relevant to the classroom.** By bringing together the educators who have deep knowledge of student learning experiences, the students who experience learning firsthand, and the researchers and developers who have knowledge of math learning science, new learning approaches are most effectively integrated into curricula, designed for straightforward implementation, and adaptable in response to district, school, and classroom contexts.
- + Student mathematics learning outcomes are improved when executive function skills are strengthened alongside positive student beliefs.** The early research findings of EF+Math's R&D teams are revealing new insights about the relationship between EF skills and mathematics learning, which point to opportunities for better and more tailored support for students. These insights explore the role of various EF skills in supporting both mathematical content knowledge and problem-solving skills.
- + Effectively building students' executive function skills during mathematics learning requires new instructional strategies, tools, and assessments.** In our Inclusive R&D processes, designing strategies, tools, and assessments simultaneously is essential for equity-centered, evidence-based iteration. EF+Math's R&D teams are building such adaptive assessments and tools alongside their learning approaches, which contributes to their dynamic understanding of student learning and drives iterative, continuous improvement of math learning approaches.
- + New student-centered tools and assessments emerge when diverse teams focus on designing for equity.** The EF+Math R&D teams are creating mathematics learning approaches that use culturally responsive classroom practices, such as student-centered, culturally inclusive instruction, and that foster collaboration and relationship-building to best help each student succeed. Further, teams are developing and adapting assessments to better center student identities and reinforce asset-based mindsets around learning.
- + Centering equity from the beginning leads to mindset shifts and a culture of equity and inclusion throughout the process.** Over the past two-and-a-half years, EF+Math teams have demonstrated ways to implement equity-first Inclusive R&D in practice, and they have generated new insights on the promise of this approach. Once an equity-first mindset is established, equity becomes embedded in every aspect of R&D work—including the output products.

Call to Action

Early results show the potential of EF skills as a lever for improving mathematics learning, while simultaneously uncovering new information about the relationships between mathematics learning and EF skills; additionally, we are generating promising new assessment tools and learning approaches that not only benefit students now, but can also inform evidence-based design of future curriculum, learning technologies, and teaching strategies.

The impact of EF+Math's work is already expanding beyond our community, shifting influential individuals' and organizations' behaviors and actions to be more asset based and equity centered. EF+Math's intentional emphasis on equitable processes and equity-centered and engaged people is creating a ripple effect that is transformative.

As we continue in this process, we issue a call to action. We invite additional partners, including new educator partners, to join us, become part of this growing movement, and actively participate in the continued improvement and evaluation of these promising mathematics learning approaches. We see the promise for students with the adoption of Inclusive R&D practices and look forward to engaging with the broader community of educators, researchers, and developers to collectively advance the field toward Inclusive R&D practices.

With efforts from all of us across multiple sectors and with different areas of expertise, we can collectively transform mathematics education for our students and dramatically improve their mathematics learning outcomes.

All students are powerful learners.

Advanced Education Research & Development Fund (AERDF)

<https://aerdf.org/programs/ef-math/>

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About EF+Math and the Advanced Education Research and Development Fund (AERDF)

EF+Math is an advanced R&D program that funds and supports teams of educators, researchers, and developers to co-create rigorous math learning approaches that improve learning outcomes and affirm the brilliance of Black and Latinx students and students experiencing poverty. EF+Math was launched in 2019 and serves as a demonstration program for AERDF, a national nonprofit R&D organization that builds ambitious, inclusive three-to-five-year programs with education practitioners, aimed at tackling persistent teaching and learning challenges that disproportionately affect Black and Latino students and students of all races experiencing poverty in grades Pre-K–12.

