# Supporting Executive Function in Schools: A Look at Three Promising Program Models

By Sarah Lohnes, MPP

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ABELL FOUNDATION

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## EXECUTIVE SUMMARY

A small but growing cadre of schools and districts across the nation are turning to interventions rooted in brain science to complement or replace core curricula. Such programs target a related set of cognitive processes, known as executive function (EF), that are key to learning. The three foundational skills and processes that make up EF are:

- Working memory: the ability to hold information in mind for recall and application
- Cognitive flexibility: the ability to think about something in multiple ways, flexibly shift the focus of one's attention, and generate multiple solutions to a problem
- Inhibitory control: the ability to inhibit fast and unthinking responses to stimulation[1]

Executive function skills are essential for planning, executing, and monitoring goal-directed behavior,[2] and are therefore central to problem-solving and learning. EF is associated with core academic achievement in reading, math, science, and social studies for typically developing children as well as those with special needs.[3]

EF is limited by the experience of severe, frequent stress or adversity. Unfortunately, poverty and adverse childhood experiences affect nearly half of all U.S. children, leaving many children struggling to build foundational skills that are the building blocks for a successful academic, social, and professional life.

Fortunately, we now know that our brains are capable of change, growth, and regeneration throughout our lifetimes. Studies show that a variety of interventions can help to improve executive functioning from early childhood through adolescence.[4]

While all students can benefit from these programs, because of a strong connection between trauma, poverty, and altered executive function, students in schools and districts in areas of concentrated poverty may benefit the most from targeted EF programs.[5] This paper set out to understand the potential for EF training programs to support students in one urban district—Baltimore City Public Schools (BCPSS).

This paper draws from interviews with program developers and administrators in Baltimore and other districts to understand the use of evidence-based and promising EF programs and gather lessons learned and recommendations for interested schools and districts. Because they are in active or recent use in BCPSS, this report focuses on three

EF programs profiled in a 2019 BrainFutures report: ACTIVATE, Tools of the Mind, and Holistic Life Foundation's Stress Reduction and Mindfulness Curriculum, now called Mindful Moment.

## Key Findings

The key implementation finding across programs is that administrators and educators alike must understand and support the purpose of EF programs and commit to implement them consistently, as designed. District and school leaders recommend delivering tailored professional development to fit EF programs to the local context and broader teaching and learning paradigm.

District and school leaders also recommended allocating dedicated staff to provide technical assistance and coaching on EF programs; starting programs at the beginning of the school year; and carving out dedicated time in the school schedule for program implementation.

Results from featured programs implemented in BCPSS include:

- **ACTIVATE:** Improvement on iReady reading and math scores
- **Tools of the Mind:** Kindergarten readiness scores that exceed district and state averages
- **Mindful Moment:** 70% of schools see a reduction in suspensions

Recommendations for scaling successful EF programs in BCPSS include:

### 1. Offer districtwide PD on executive function.

Such trainings can empower educators to understand the fundamentals of working memory, inhibitory control, and cognitive flexibility and how they are affected by stress.

### 2. Invest in external evaluation of existing EF programs.

There is more to be learned about the conditions under which these programs are most effective, and for whom. A study of the implementation of one or more EF programs could help the district and school leaders understand the program features and staff competencies most related to successful student outcomes.

### 3. Fully vet Tools of the Mind as a possible new district pre-K curriculum.

District leaders should consider visiting Denver to see a mature implementation of Tools in action as they review early learning curricula for the district.

### 4. Use summer learning and after-school program to pilot or expand EF approaches.

Such programs offer flexible environments for trying new approaches that serve school-year goals. Baltimore's public and private funders offer grant funds for community-based youth programs, and the district already partners with a variety of arts programs that could be a good fit to pilot EF approaches.

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## INTRODUCTION

How can schools focus not just on *what* students learn, but also on *how* students learn?

A growing cadre of schools and districts across the nation are turning to interventions rooted in brain science to complement or replace core curricula. Like warm-ups and workouts that stretch and strengthen key muscles, these interventions are less about content and more about fortifying the underlying neurological capacities of students.

The increased interest in the brain is spurred in part by rapidly advancing imaging technology that has improved scientists' understanding of the neural mechanisms that support and impede learning. Imaging methods such as functional MRI and positron emission tomography (or PET scans) highlight the areas of the brain that activate during certain tasks.[6] Combined with a new understanding of neuroplasticity—the way brain circuits configure and reconfigure to serve new purposes—brain scientists are equipped to test ways to strengthen the brain connections that are key to learning. These insights from research are now being turned into a new class of learning resources used in classrooms.

Some programs target a related set of cognitive processes, known as executive function (EF), that are essential to learning. A variety of EF programs, including computerized games, comprehensive curricula, and mindfulness exercises, have been shown to strengthen key learning pathways. Because of a strong connection between trauma, poverty, and compromised executive function, schools and districts in areas of concentrated poverty may benefit the most from targeted EF programs.[7] This paper sets out to understand the potential for EF training programs to support students in one urban district—Baltimore City Public Schools (BCPSS).

This report draws from interviews with program developers and administrators in Baltimore and other districts to understand the use of evidence-based and promising EF programs as described in the 2019 BrainFutures report "Brain Fitness and Executive Function: Evidence-based interventions that improve student outcomes." This report focuses on three EF programs profiled in the BrainFutures report that are in recent or active use in BCPSS: ACTIVATE; Tools of the Mind; and Holistic Life Foundation's Stress Reduction and Mindfulness Curriculum, now called Mindful Moment.

While only a small subset of Baltimore schools are implementing these three programs, other districts nationally are delivering them at greater scale. This report includes insights from Baltimore City and those other districts as a way to imagine the impacts and challenges of implementing executive function programs at greater scale in Baltimore. Findings describe what the programs look like in action, how districts are using them, what teachers and administrators think, and how they are making a difference.

With nearly $200 billion in federal COVID-19 relief funding provided to states and districts, including about $700 million to Baltimore City Public Schools, there are new opportunities to shake up teaching and learning with brain-based approaches. Districts are already swimming in a sea of interventions, curricula, technology, and programs designed to catch students up. Can EF programs play a role in district plans, and how will they decide which EF programs to implement? How can further research help districts understand what works best, for whom, and when?

# THE NEED FOR EXECUTIVE FUNCTION SKILLS

## What is EF?

Executive function (EF) is a specific and related set of skills involved in conscious problem-solving and self-directed, controlled behavior. The three foundational skills and processes that make up EF are:

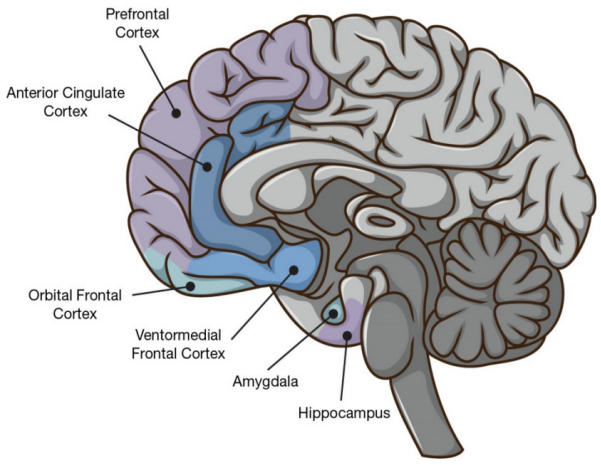
- Working memory: the ability to hold information in mind for recall and application;
- Cognitive flexibility: the ability to think about something in multiple ways, flexibly shift the focus of one's attention, and generate multiple solutions to a problem; and
- Inhibitory control: the ability to inhibit fast and unthinking responses to stimulation.[8]

Together, these skills make it easier for people to recognize and focus on the most important stimuli, ignore distractions, think before acting, regulate their emotions, see another person's perspective, and avoid making decisions based solely on short-term gain.[9] Executive function skills are essential for planning, executing, and monitoring goal-directed behavior,[10] and are therefore central to problem-solving and learning.

EF skills begin developing shortly after birth, strengthen dramatically between ages 3 and 5, and continue to grow significantly throughout childhood and adolescence.[11] They are controlled by neural circuits involving regions of the prefrontal cortex (PFC) and other areas of the brain, primarily in the frontal lobes. Deficits in executive functions are associated with decreased functioning in the most forward areas of the frontal lobes (in the forehead) as well as the cortical and subcortical structures that connect to the frontal lobes.[12]

EF skills are modulated by neurotransmitters like dopamine, adrenaline, and serotonin, which allow the brain to respond to changes in the environment by adapting behavior. Because of their important role in regulating executive function, "changes in these systems can also have a grave impact on executive function."[13]

Figure 1: Medial view of select brain regions relevant to executive function




Source: https://files.eric.ed.gov/fulltext/ED570880.pdf

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# Link between Executive Function (EF) and Social-Emotional Learning (SEL)

In recent years, many districts have taken a "whole-child" approach that includes a focus on building social-emotional skills that help students persevere through challenges, among other important outcomes. While there is some overlap between SEL and EF skills, primarily in the area of self-regulation or inhibitory control, a focus on SEL does not replace or replicate a focus on EF. Instead, the two skillsets are complementary.

"Good executive function allows us to take in enough information to have a basis for our choice, see that there are options to that choice, and take enough time to make the best decision. Social and emotional learning allows us to make a choice better by integrating the needs of others and the environmental norms and expectations into the context of the decision—function combined with awareness."[i]

In short, children need both EF and SEL skills to thrive in school and life.

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i The link between executive function and social-emotional learning (Nov. 17, 2020). Retrieved from: https://blog.edmentum.com/link-between-executive-function-and-social-and-emotional-learning-basics

## Why Does EF Matter?

Like an air traffic controller, EF plays an important role in overseeing complex brain functions and deciding what takes precedence. Without EF, the wide variety of stimuli the brain is processing can feel like hundreds of planes trying to land on the same runway at once.

Executive function issues present differently in different children and youth. In some cases, children may have trouble controlling their impulses and regulating their emotions. Other children may have difficulty staying organized, managing their time, and remembering instructions in class.[14]

EF skills are important throughout the lifespan. For example, EF skills help adults get and keep a job, care for children, manage a household, and support their community. Without properly developed or maintained EF skills, adults may find it difficult to navigate and persist through these tasks.[15] Adolescents who struggle with executive function may have a difficult time living independently and making plans for the future.

Well before adulthood, EF measured in childhood predicts a wide range of important outcomes, including readiness for school, school performance and social competence in adolescence, better physical health, higher socioeconomic status (SES), and fewer drug-related problems and criminal convictions in adulthood.[16]

EF-related skills like self-control, emotional regulation, planning, problem-solving, and reflection skills are all required to benefit from school. In fact, EF is a similar, and sometimes better, predictor of academic performance than IQ.[17] EF is associated with core academic achievement in reading, math, science, and social studies for typically developing children as well as those with special needs.[18] Students with low reading ability demonstrate deficiency in EF skills. Specifically, poor working memory inhibits normal language development.[19]

## What Threatens EF?

EF is limited by the experience of severe, frequent stress or adversity that can be experienced across all racial and socioeconomic groups. During childhood, these experiences are often described as Adverse Childhood Experiences (ACEs) that include maltreatment/neglect; parental substance abuse; family member mental illness; exposure to domestic violence; the incarceration of a parent; and physical, emotional, and sexual abuse. There is a strong relationship between ACEs and poverty. Children born into neighborhoods with high levels of poverty report an increased number of ACEs by age 15. Those born into neighborhoods of concentrated poverty (40% or more of residents in poverty) are more likely to experience four or more ACEs.[20] Children with four or more ACEs are 32 times more likely to have a learning or behavioral issue when compared to children with no adverse childhood experiences.[21]

A systematic review of 36 studies found a strong relationship between maltreatment (e.g. abuse, neglect, and exposure to intimate partner violence) and EF deficits among children.[22] Toxic stress overrides the brain's thoughtful decision-making systems to ignite a fight-or-flight response that is designed to help us survive. A scary or stressful event sends stress hormones epinephrine and cortisol surging throughout the brain. Those compounds act as neurotransmitters by helping neurons communicate with one another. In the case of stress or adversity, they circulate a "danger" message throughout the brain to set it to emergency operating mode. In early childhood, persistent messages of this type redirect brain development away from planning and impulse control and toward rapidly responding to threats. As a result, EF processes are underdeveloped, particularly for those with elevated ACE scores; young people may require additional supports to counteract their brain's natural response and develop their EF skills.

Unfortunately, poverty and ACEs affect nearly half of all U.S. children, leaving many children struggling to build foundational skills that are the building blocks for a successful academic, social, and professional life. The COVID-19 pandemic has raised further concerns about ACEs by creating new stressors and exacerbating those that already existed.[23]

## What Supports EF?

While there are certain peak periods for development early in life, we now know that our brains are capable of change, growth, and regeneration throughout our lifetimes. This new knowledge gives scientists and educators renewed hope in the power of behavior and practice to strengthen and rebuild key neural pathways. Studies have shown the power of focused educational interventions to strengthen the white matter tracts that connect one part of the brain to another, including among students with learning disabilities.[24]

There are two distinct periods when gray matter volume in the pre-frontal cortex reaches its peak: early childhood (ages 2-6) and the transition to adolescence (beginning around age 10 and up to the late teens). Gray matter processes information—it's full of neural connections that are shaped by experience. So, the more the brain uses neural

# The Promise of the Arts to Strengthen EF Skills

While this paper focuses on three specific classroom EF programs that primarily utilize adaptive computer games, make-believe play, breathwork, meditation, and movement modalities, it is worth noting that a variety of visual,[i] performing,[ii] and literary arts[iii] have also been shown to improve EF and EF-related skills.

Launched in 2015, Houston's **Arts Access Initiative** (AAI) is a partnership between Young Audiences of Houston; Houston Independent School District (HISD); and dozens of community organizations that "support arts as a vital component of students' cognitive, emotional, creative, and academic development."[iv] Participating schools are required to co-fund enhanced arts experiences through teaching-artist residencies, in-school professional artist performances, field trips, and after-school programs. Principals also engage in strategic arts planning with the AAI director, designate a campus-level arts liaison to coordinate and facilitate AAI-related efforts, participate in teacher and principal arts-integration professional development, and attend AAI peer-network mentoring sessions. Enhanced arts programming includes dance, music, theatre, and visual arts.

Demand for AAI participation exceeded supply in the first two years of implementation, allowing researchers to study differences between students who participated and those who did not. More than 10,000 students in Houston in grades four to eight were randomized into treatment and control groups to study the program's impact. AAI significantly reduced the proportion of students receiving disciplinary infractions by 3.6 percentage points when compared to students in the control group, with particular benefit for male African American students. Researchers also found that increases in arts educational experiences improved STAAR writing achievement by 0.13 of a standard deviation and increased students' compassion for others by 0.08 of a standard deviation.[v] These findings are promising and warrant further exploration.

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i Fernandes, M. A., Wammes, J. D., & Meade, M. E. (2018). The Surprisingly Powerful Influence of Drawing on Memory. *Current Directions in Psychological Science*, 27(5), 302–308. https://doi.org/10.1177/0963721418755385

ii Park, S., Lee, J.-M., Baik, Y., Kim, K., Yun, H. J., Kwon, H., Jung, Y.-K., & Kim, B.-N. (2015). A Preliminary Study of the Effects of an Arts Education Program on Executive Function, Behavior, and Brain Structure in a Sample of Nonclinical School-Aged Children. *Journal of Child Neurology*, 30(13), 1757–1766. https://doi.org/10.1177/0883073815579710

iii Klein, K., and Boals, A. (2001). Expressive writing can increase working memory capacity. *Journal of experimental psychology. General*, 130(3), 520–533. https://doi.org/10.1037//0096-3445.130.3.520

iv Arts access initiative (n.d.) Mayor's Office of Education. Retrieved from: https://www.houstontx.gov/education/arts_access_initiative.html#:~:text=Houston%E2%80%99s%20Arts%20Access%20Initiative%20is,%2C%20cre-ative%2C%20and%20academic%20development

v Bowen, D., and Kisida, B. (2019). Investigating causal effects of arts education experiences: Experimental evidence from Houston's Arts Access Initiative. Retrieved from: https://kinder.rice.edu/sites/default/files/documents/Investigating%20Causal%20Effects%20of%20Arts%20Education%20Experiences%20Final_0.pdf

A 12-week intensive classroom arts program, **Art of Learning**, also showed EF benefits to students in a randomized controlled trial. The program includes 36 predesigned creative learning practices from six different art forms delivered one hour per day, three days per week. Each activity is specially designed to address either one or more EF skills. Both treatment and control groups improved their EFs over time on the BRIEF global executive composite (GEC) score, the metacognition index, and the behavioral regulation index (BRI). However, the intervention group displayed a significantly greater improvement than the control group on the GEC and BRI. Teacher interviews describe positive effects for participants related to collaboration, conflict management, inclusion, vocabulary, and confidence.

A similar effort to Houston's AAI is underway in Baltimore. The **Arts Every Day's Schools Program** is a partnership between Arts Every Day; Baltimore City Public Schools; and over 100 arts organizations, cultural institutions, and teaching artists in Baltimore. The program is in 41 schools in the 2021-2022 school year.

Arts Every Day partners with schools to provide:

- Teacher professional development in arts and arts integration;
- A framework for progress toward an arts-rich culture of learning;
- Individualized school strategies to support innovation, collaboration, and change schoolwide;
- Funding to support artist residencies, workshops, and trips to local museums and institutions across Baltimore City; and
- Access to special offers, and reduced and free tickets for student arts programs provided by Arts Every Day's vast array of artist and organization partners.

connections to perform a specific task, the better it gets at that task. This functionality can both hinder and help EF. The more the brain uses connections for survival, the more they are "wired" for survival. On the other hand, the more the brain practices EF skills, the more efficiently it completes those tasks and the more likely the brain will activate them in the future.[25]

Studies show that a variety of interventions can help to improve executive functioning from early childhood through adolescence[26] and that those EF improvements can lead to better academic outcomes.[27] Specific to pre-K-12 classrooms, interventions typically include systematic cognitive training programs that target one or more EF skills, often through a computer-based platform, and more rarely, comprehensive classroom curricula.

Games and tutoring have been shown to improve EF on EF-specific measures and sometimes demonstrate transfer effects to standardized tests of core subjects. However, the research on outcomes on reading and math achievement is at an early stage.

Another class of EF intervention—mindfulness programs—can also improve executive functioning by lowering stress levels and improving self-regulation and attention.[28] Mindfulness programs have also shown improved academic performance.[29] Breathing, yoga, and meditation, as well as brain literacy and some social-emotional learning programs, can all fit into this category of EF-friendly interventions.

Neuroimaging has shown strengthened neural connections in areas of the brain that are key for learning after both targeted classroom EF training[30] and mindfulness practice.[31]

### *The spectrum of evidence-based EF interventions*

The BrainFutures report "Brain Fitness and Executive Function: Evidence-based interventions that improve student outcomes" profiles 10 evidence-based EF interventions meeting the following criteria:

- At least one randomized controlled trial or quasi-experimental study with sample size of at least 10, published in a peer-reviewed journal;
- At least one classroom-based intervention (as opposed to purely research or clinical setting);
- EF outcomes in at least one study (working memory, attention, inhibitory control, etc.); and
- Typically developing students in at least one study (as opposed to students with learning disabilities or behavioral disorders).

These programs range widely in duration, intensity, and focus, from 10 minutes per day of guided mindfulness to a full-day comprehensive curriculum, and everything in between. Although all of these interventions qualify as "evidence-based," their focus and intended purpose vary widely.

## Can EF be Measured?

EF skills can be measured through a variety of assessments of inhibitory control, attention, working memory, cognitive flexibility, and processing speed, among others. For illustration, the following three assessments are part of the National Institutes of Health Toolbox Cognition Battery:

**The Flanker Task** is an assessment of inhibitory control and attention. Students see five arrows in a row, all of which are pointing either to the left or right. Using the arrow keys on their keyboard, students are asked to identify which way the arrow in the middle is pointing. Doing so requires them to mentally block out the arrows on either side of (flanking)

the one in the middle. Their reaction time is used to assess focused attention.

**The List Sorting Working Memory Test** presents students with a series of images of animals or household objects. Then, they must select the objects just seen from among a grid of 16 objects, clicking them in order from smallest to largest rather than the order in which they were presented. The test starts with a list of two objects. If the child completes the list accurately, list length is increased by one. If the child completes the list incorrectly, the same length list is repeated. Two failed attempts at the same list length ends the test.

**The Go/No-Go Test of Response Inhibition** instructs the child to press the space bar whenever a "Go" stimulus is presented but not when a "No-Go" stimulus is presented. Students are instructed to tap the space bar as soon as they see the letter P—but to refrain from tapping when they see the letter R. Once they've completed a series of trials with "P" as the target, then they must switch and tap when they see R—but not P. In the third block, pictures of furniture are the Go trials and pictures of foods like cake and ice cream are the No-Go stimuli.

# CASE EXAMPLES

## Baltimore Context

Of course, EF interventions aren't implemented in a vacuum; the conditions that limit EF in the first place still exist. Other critical factors for developing strong EF skills include children's relationships; the activities they have opportunities to engage in; and the places in which they live, learn, and play.[32]

Baltimore City Public Schools (BCPSS) is a district of nearly 80,000 students, 58% of whom are from low-income households. Among the student population, 10% are English Language Learners and 15% qualify for special education. Students in the district are 76% African American; 14% Hispanic or Latino; 8% white; and less than 1% each Asian, American Indian, and Pacific Islander.

High levels of poverty in Baltimore contribute to higher than typical ACE scores for many residents. In the original national ACEs study published in 1998 based on a largely middle-class population, just over 50% of adults reported at least one ACE, and 13.1% reported experiencing three or more ACEs. In Baltimore City, 80% of adults reported experiencing one or more ACE and 40% reported experiencing three or more ACEs. The individual categories of ACEs that were greater in Baltimore City than in any other county surveyed in the state were: sexual abuse (state: 11%; Baltimore: 19%); domestic violence (state: 17%; Baltimore: 29%); incarcerated household member (state: 8%; Baltimore: 18%); and substance-abusing household member (state: 25%; Baltimore: 43%).[33] It is worth noting that cities with similar demographics to Baltimore, like Detroit and Cleveland, also have higher than average rates of ACEs exposure among adults.

Baltimore City Public Schools outlines its plan for meeting the unique needs of its students in its Blueprint for Success, a 2017 master plan for the district. The Blueprint is based on three pillars—Student Wholeness, Literacy, and Leadership—that inform how the district allocates resources and measures success.

Student Wholeness is described as providing students with opportunities to explore their interests in a positive culture while attending to their social, emotional, and physical well-being. Measures of Student Wholeness relevant to EF include the presence of safe spaces where students can receive social, emotional, and academic support outside of the classroom and receive interventions that help them solve problems, develop appropriate behaviors, and reduce the need for removal from the classroom. Measures also include daily classroom activities like circles and restorative practices. The district has funded 20

## COVID-19 Has Created Additional Stress for Students

The COVID-19 pandemic has exacerbated existing trauma and inequities. Students in low-income households were more likely to experience food and housing insecurities and less likely to have the computers and internet connectivity they needed to participate in virtual schooling.[i] As a result, teachers who work in higher-poverty schools were 1.7 times more likely than educators in better-off schools to report that their students' ability to focus on school-related assignments was "a lot worse" than before the pandemic. Experts say that the heightened trauma, anxiety, and stress experienced by students during the pandemic are likely to further limit executive functioning skills.[ii]

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i Carnevale, A.P., and Fasules, M.L. (February 11, 2021). Virtual Learning Is Not Child's Play for K-12 Students. *Georgetown Center for Education and Workforce*. https://medium.com/georgetown-cew/virtual-learning-is-not-childs-play-for-k-12-students-c8daee32db55

ii Harwin, A. (May 11, 2020). Will Months of Remote Learning Worsen Students' Attention Problems? *EducationWeek*. https://www.edweek.org/teaching-learning/will-months-of-remote-learning-worsen-students-attention-problems/2020/05

Social-Emotional Learning Intensive Learning Sites that include a full-time staff person and a "Wholeness Room" for students to visit for self-regulation practices. The district is also focused on professional development for teachers.

### Executive Function Interventions

This report profiles the implementation of two evidence-based programs (ACTIVATE, Tools of the Mind) and one promising program (Holistic Life Foundation's Mindful Moment[34]) that are in active or recent use in BCPSS.

#### *ACTIVATE*

ACTIVATE addresses all three components of EF through computer-presented cognitive training exercises and specially designed physical exercises. ACTIVATE was developed by doctors at Yale University School of Medicine and is distributed by C8 Sciences. Founder Bruce Wexler, MD, likens ACTIVATE to a gym with many different machines, each with different weight settings depending on students' strengths and weaknesses. The cognitive training exercises take the form of short video games, described as "brain warm-up calisthenics."

ACTIVATE's six games are highly individualized and adaptive; some games have over 100 levels of difficulty, allowing students to progress as they strengthen certain skills. In "Pirate Pete's Packing Panic," students match the objects that Pirate Pete frantically throws into the air to a category in the top right of the screen. As the child responds correctly, the game increases in complexity by adding more objects and more challenging categories. This game targets all three primary EF skills, in addition to sustained attention, speed of information processing, and multiple simultaneous attention.

In Monkey Trouble, a mischievous monkey on a tropical beach creates a pattern of objects. Students then have to repeat the pattern by

Table 1: Snapshot of Featured EF Programs

| | ACTIVATE | Tools of the Mind | Mindful Moment |
|---|---|---|---|
| **Grade Levels** | K-8 | Pre-K and K | K-12 |
| **Type** | Cognitive training through computer games and physical movement | EF curriculum | Physical movement, breathing exercises |
| **Duration and frequency** | 10 hours of computer games plus 5 hours of exercise breaks across 10 weeks. Recommended 20 minutes per day of games, 3 days per week, plus 5-min. exercise breaks twice per day. Clinical threshold varies from child to child. One study comparing students at 400 and 800 minutes of use showed a larger benefit at 800 minutes on EF tests. | Used every day, throughout the day. | 15 minutes of guided mindfulness practice twice per day, plus a staffed Mindful Moment room throughout the school day. |
| **Tech requirements** | Educator needs one computer or laptop, internet access, projector, and speakers. | Tech is not required. | Tech is not required. |
| **Initial teacher training** | 3-hour training and 1-hour follow-up. | Year one includes five total days of PD for teachers. Year two includes two full days of PD for teachers. | Mindful Moment is delivered by staff of the Holistic Life Foundation. |
| **Snapshot of evidence** | A randomized control trial of 583 second graders (211 in control) who used the program's computer games 3-4 times per week and completed physical exercises 1-2 times per week showed improvements in standardized tests of math and reading that outpaced 1:1 tutoring. | A cluster randomized control trial of 723 kindergarteners across 12 districts and 29 schools showed a significant increase in working memory and academic performance in math. A one-year follow-up study found significantly lower levels of aggression and behavior problems and better working memory, and reading and math performance than the control group.* | A randomized control trial of 97 fourth and fifth grade students across four urban schools found a positive impact on problematic responses to stress including rumination, intrusive thoughts, and emotional arousal after a 12-week program.** |
| **Scale of implementation** | Used by thousands of students in more than 100 schools in U.S., Canada, Australia, and Scotland. | In the 2020-2021 school year, Tools was implemented by 139 districts and 1,656 classrooms, reaching 27,165 children. | In the 2020-2021 school year, Mindful Moment is being used by 9,100 students in New York state and Maryland. |

Source: This table draws heavily from the 2019 BrainFutures report "Brain Fitness and Executive Function: Evidence-based interventions that improve student outcomes."

* https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0112393
** https://hlfinc.org/wp-content/uploads/2013/03/Feasibility-and-preliminary-outcomes-of-a-school-based-mindfulness-intervention-for-urban-youth1.pdf

clicking on the right objects in the right order. The pattern gets longer if the student answers correctly, and shorter if they make a mistake. This game targets spatial working memory, sustained attention, and cognitive flexibility.

## A CLOSER LOOK: BALTIMORE

One Baltimore school, Furman L. Templeton Preparatory Academy (FLT), implemented ACTIVATE in the 2018-2019 and 2019-2020 school years. FLT is one of five schools in Promise Heights, a cradle-to-career initiative in West Baltimore funded through a federal Promise Zone grant since 2009. The University of Maryland School of Social Work administers the funding locally.

Promise Heights leaders were interested in executive function programming, and after hearing a presentation from ACTIVATE, they visited a school in Brooklyn that had been using the program for six years to see it in action.

"The teachers were so excited about it," said Rick Barth, Ph.D., professor at the University of Maryland School of Social Work. "I talked to a special education teacher who said it changed her classroom in terms of what students could accomplish. It seemed very easy to implement. The kids seemed to be enjoying it."

Promise Heights hired Latoria Mackey-Jones to lead the implementation of ACTIVATE at FLT as part of her role as community school director.

ACTIVATE has been evaluated in typical and ADHD populations. In one study, students completed the ACTIVATE games as a primer immediately before completing math or reading curricular content games. Researchers found that student accuracy on the math and reading games was significantly enhanced by the ACTIVATE warm-up games. By the end of the year, the ACTIVATE class had 12.8% more students meeting proficiency than the control class.[35]

"There are definitely some infrastructure needs that need to be addressed by a dedicated person, at least 50% of a full-time position," said Barth.

Promise Heights implemented ACTIVATE as a research study, selecting one treatment classroom and one control classroom in grades one to five. In the first year of the study, teachers in treatment classrooms had difficulty meeting the target of 60 minutes per week of ACTIVATE. In the second year, the school narrowed its focus down to the classrooms with the most teacher engagement and buy-in to the program while also eliminating the program in first grade, citing student difficulty navigating the software.[36]

According to Mackey-Jones, the school struggled to fit ACTIVATE into a school day already packed with programs and initiatives.

"Our school is heavy on technology, so we thought bringing it to our school would be great," she said. "I think the issue was that we have a lot of programming that happens at our school. Students had to get on at least twice a week. To accommodate that, we had to include one session in the classroom. It was really hard for teachers to find time to implement in the classroom setting and not just in computer class."

While the school only achieved moderate fidelity in implementation, reading and math data show a relationship between the amount

of time spent on ACTIVATE and improvement on iReady test scores (an adaptive diagnostic assessment used for reading and math in K-12 schools). It is possible, however, that the students with more minutes on ACTIVATE were already more academically engaged, and therefore would have made larger gains regardless of the time spent on the computer.

Mackey and Barth both believe ACTIVATE can be successful in the right environment. Mackey said that teacher buy-in is essential.

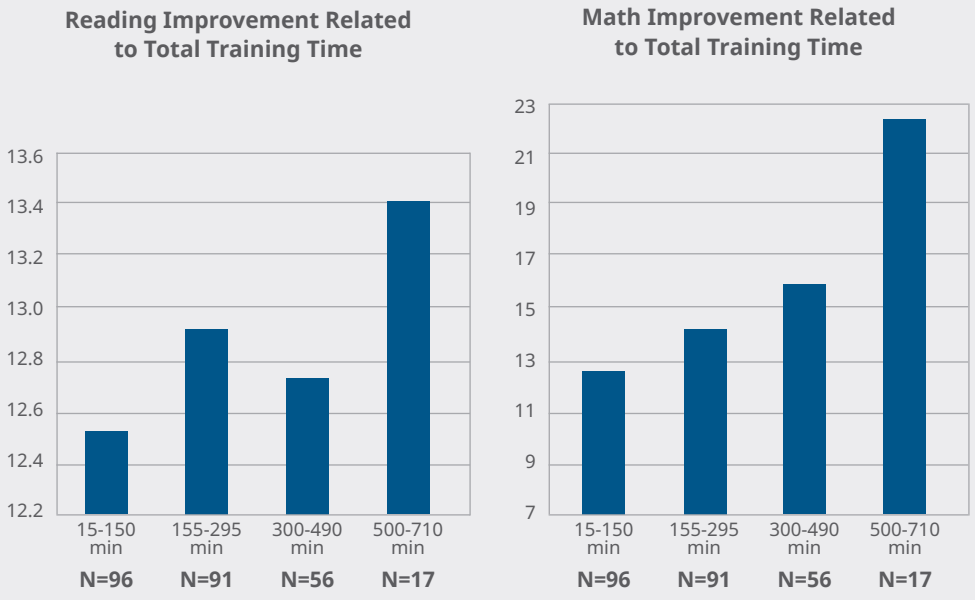
"In classrooms where teachers really supported it, their students were actively engaged and as excited as the students I saw on the site visit in Brooklyn," she said.

Mackey said that the program would be best in a school that could incorporate it from the beginning into a whole-school culture and a regular classroom schedule, like she saw in Brooklyn.

"It was introduced to our school in October," she said. "We had already started the school year and gotten into a routine. We had a one-day training and then they implemented the next week. And, only certain classes were using it. I think that caused issues within the schedule and prevented the program from being embraced as the culture of the school."

Both Mackey and Barth recommended that schools make time for additional training beyond the minimum requirement from ACTIVATE to help teachers prepare and test out the program.

Figure 2: Improvement in iReady Reading and Math Scores in Relation to Amount of Time Using ACTIVATE at Furman L. Templeton Preparatory Academy 2018-2019




Source: ACTIVATE

## A CLOSER LOOK: THE EVANSVILLE VANDERBURGH SCHOOL CORPORATION

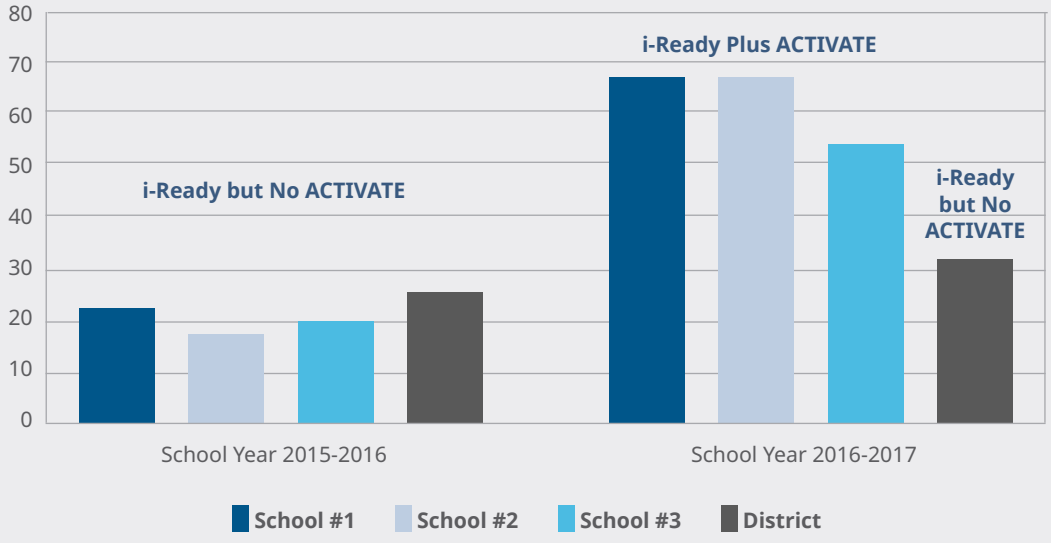
The Evansville Vanderburgh School Corporation (EVSC) in Evansville, Indiana, began using ACTIVATE in the 2016-2017 school year as part of Growth in Academics through Innovation and Neuroeducation (GAIN), the district's comprehensive framework for student success.

"Our students had made gains, but then they plateaued," said Susan Phelps, EVSC director of neuroeducation. "We'd get 'better' curriculum and keep having the same results. We needed to infuse educators with a new lens to make better decisions. We looked at root causes and found that EFs were really a better predictor of outcomes for students. We can't skip over them and go straight to teaching content."

The district's whole-child approach is based in a neurodevelopmentally sequenced model that attends to both the cognitive and affective skills that students need to succeed. GAIN focuses on creating the right conditions for learning, which include priming students'

Similar to Furman L. Templeton Preparatory Academy, three high-poverty elementary schools in Duval County, Florida, implemented ACTIVATE and saw significant improvements on iReady reading scores within one year, outpacing districtwide performance.

Figure 3: Percent of children showing expected one-year growth in reading competency




Source: ACTIVATE

brains with executive function warm-ups and weaving SEL throughout the day to complement a focused SEL curriculum. Every school day starts with a connecting and refueling activity from the district's universal self-regulation curriculum for K-8.

The district has identified compromised EF as a root cause of reading challenges. EVSC started using ACTIVATE in its seven highest-need elementary schools and one alternative middle school as a whole-school program. When ACTIVATE increased in cost, the district began to target specific grade levels.

The district is now using ACTIVATE in kindergarten classrooms in five schools and looping with students (serving the same students each year) in four schools. It's used in all self-contained and "intensive" classrooms where students are deemed highest risk and more holistically through its multi-tiered system of supports.

"The nice thing about ACTIVATE is that it starts off with simple tasks and then increases in complexity so those skills develop and generalize," Phelps said. "You'll find with other cognitive training programs that those skills don't generalize."

ACTIVATE uses performance-based measures from the National Institutes of Health Toolbox that monitor students' progress throughout their use. ACTIVATE provides a variety of analytics to teachers to track student progress.

While acknowledging that it's time-intensive, Phelps recommends that districts screen all students in K-2 for executive function deficits.

"You have to remind people that the purpose of a universal screener is to identify kids before they fail," she said. "It's a heavy lift in the beginning to get the kids screened, work through technology issues, and have them use the brain exercises regularly. The younger the kids, the more deficit they have in EF, the more support they need."

Phelps said that finding an efficient way to screen students and quickly move them into intervention groups is important so they can hit at least 600 minutes before spring assessments.

"The middle of the year benchmark doesn't show gains because students are at 200 minutes. In 2018-2019, we didn't get kids into seats until October and then they did end-of-year assessments in April, so kids hadn't reached the therapeutic effect yet."

Training and ongoing technical assistance for teachers are essential. "We provide PD on the 'why' behind ACTIVATE and EF and the 'how' to use the technology," Phelps said. "Then, we allocate a teacher to provide technical assistance regularly in the first nine weeks, about two hours each morning. The headache is more the IT side of it. You need space for technical challenges to be addressed in the beginning."

According to Phelps, students using ACTIVATE score more than 45 percentage points higher in reading and math on the state testing platform than similar students not using ACTIVATE.

EVSC monitors the program through grade-level professional learning communities, walk-throughs, and data it receives from ACTIVATE on individual students and classrooms.

Phelps also said that teachers are key to buy-in and success. "We have one teacher that took it upon himself to get his kids started early and keep them on it, and the benefit of that is off the charts. If you do it well, the outcome is worth it."

In 2021-2022, the district's high-poverty schools spent the first eight days exclusively learning and practicing self-regulation skills. "Kids who are moderately to significantly behind will not change without intentional rehab and practice of those skills," Phelps said.

## *Tools of the Mind*

Tools of the Mind (Tools) is a comprehensive curriculum for pre-K and kindergarten. According to the Tools website, the program supports an approach to teaching that "helps young children develop the cognitive, social-emotional, self-regulatory, and foundational academic skills they need to succeed in school and beyond." Tools content centers on mature play and make-believe that are intentionally scaffolded; it is less about toys and more about relationships. The key elements include:

- **Plan**—children's ability to think about play in advance of playing;
- **Roles children play**—including the actions, language, and emotional expressions that are associated with a specific role;
- **Props**—the objects (real, symbolic, and imaginary) children use in play;
- **Extended time frame**—play that lasts for long stretches of time: within one play session for an hour or longer, or extending over several play sessions and over several days;
- **Language**—what children say to develop a scenario or coordinate the actions of different players as well as speech associated with a particular role; and
- **Scenario**—what children act out, including the sequence of scripts and interactions between roles.[37]

According to Tools of the Mind, the curriculum addresses EF throughout the day—every day—as children learn to plan their play, intentionally focus and sustain their attention, learn and use strategies for remembering and learning, and reflect on their work. They practice these skills in small-group and partnered games and activities.

Tools of the Mind started in 1996 as a faculty research project at the University of Colorado.

"We were interested in helping young children develop the mental tools to learn how to learn," said Tools of the Mind co-founder Deborah Leong, Ph.D. "In teaching, we often emphasize the child's ability to get the right answer, but we don't help them understand how they got it, how they know it's correct, and what it means if it's wrong. For children with lower levels of skills, they don't ever get to understand their own thinking."

In Tools classrooms, children help each other think about how they learn. Each day, every child interacts with every other child in intentional conversation. They discuss the stories they hear and share and rehearse their plans for make-believe play, which centers on a theme like restaurants or airports. In the airport theme, students plan and practice going to the airport to take a trip, including packing their bags, going to the ticket counter, going through security, and finding their gate. Instead of just playing with props/toys, they present their plans to their peers and rehearse a sequence of scripts and actions based on their role.

*Sample Play Plan*


"I am going to play with the space shuttle." (Source: Tools of the Mind)

"Rehearsing is why we have such high oral language skills among our students," said Leong. "Through sharing their plans, children learn to take turns and negotiate to solve problems. They inhibit their first reaction and instead compare what they are hearing to their plans."

In addition to make-believe play, Tools includes organized time blocks that can be arranged flexibly, including mystery question, free choice, opening group, and community building.

Each district using Tools measures success in its own way. Tools staff work with districts to pair Tools assessments with district assessments to create a complete picture. Tools includes an embedded developmental writing assessment that provides a map of the child's phonics knowledge in a dashboard that tracks growth over time. Data-sharing agreements with districts allow Tools to analyze data and report it back to districts.

Professional development (PD) for Tools is central, robust, and ongoing.

"I think what sets us apart is that we train teachers across the school year, not just during intercession before school starts," said Megan Spacciapoli, Ph.D., director of evaluation and P-3 partnerships at Tools of the Mind. "We match teachers with just the amount of information they need until we see them again."

The first year of Tools implementation includes five days total of PD for teachers where they learn a bit of theory of the "why" behind the curriculum in addition to the "what" and "how." Tools also trains teaching assistants at the classroom level and provides coaching support in between workshops and throughout the year.

The second year of Tools implementation includes two PD workshops (fall and winter/early spring) that provide educators the opportunity to refine their implementation of the Tools program through a continued focus on child development, dynamic assessment, and individualized instruction. Teachers analyze how Tools activities are designed to support self-regulation while also developing children's academic skills, and learn how to embed practice in self-regulated learning into all activities and classroom practices.

According to Tools of the Mind, 80% of the teachers who have been trained since 2010 are still using the program today.

Tools introduced a variety of online resources to support remote learning in the 2020-2021 school year. Through Parent Connect, an online platform, parents can upload a video of their child doing one of the activities so that the teacher may provide coaching and support.

### Tools of the Mind and Kindergarten Readiness

A large, urban school district in the Southwestern U.S. has been formally implementing Tools since 2018 and has seen promising results. In 2020-2021, 82 classrooms across 17 schools implemented Tools in pre-K, kindergarten, or both grades. Based on spring 2019 Teaching Strategies Gold (TS Gold) observational assessment scores in Title I schools in this district, children in Tools classrooms had statistically significantly higher scores on cognitive, language, literacy, and social-emotional scales than those in other pre-K programs—resulting in about 5% more Tools students meeting proficiency on those scales than non-Tools students. Scores were not significantly different for math or physical scales. In the 2019-2020 school year, more children who attended a Tools pre-K met or exceeded grade-level expectations on kindergarten entry literacy assessments than those who did not attend a Tools pre-K.

Source: Tools of the Mind

The teacher's feedback is automatically translated into 100 different languages, so the teacher and parent can easily communicate back and forth in the same language.

"People went bonkers over it," Leong said. "They said it was the first time they really understood what's going on in school and how they can help their child."

## A CLOSER LOOK: BALTIMORE

Tools came to Baltimore City as a result of 100% Project Tools of the Mind Coordinator Berol Dewdney, a teacher at the Commodore John Rodgers Elementary/Middle School (CJR), shadowing a principal at D.C. Public Schools Grow Academy through her Teach For America internship. Dewdney saw the curriculum in action and was "blown away." Over the next two years, she dove into the neuroscience research and learned more about Tools. She then presented her research to her school principal and was encouraged to implement a pilot of the program.

Dewdney acknowledges that Tools is more than just a curriculum.

"Transforming how you teach teachers and transforming educational spaces means a lot of change," she said. "I had to ask myself, can we do this? Can we completely overhaul? Can we change how we teach our teachers?"

The pilot formally began in 2015-2016 at CJR. Today, 27 classrooms in Baltimore City implement Tools for pre-K, reaching about 540 students. Four of the schools implementing the Tools curriculum are part of the 100% Project Network—a group of schools working to improve outcomes based on the original program success at CJR. Two of the Tools of the Mind schools also have Judy Centers, state-funded early learning centers that target a variety of education and health resources to children and families in Title I schools.

The 100% Project uses the following multipronged approach to measure the success of Tools:

- **Students:** Early Learning Assessment, Kindergarten Readiness Assessment, Developmental Writing, DIBELS, and anecdotal reports;
- **Teachers:** data analysis and coaching cycles documentation, implementation fidelity rubrics and scores, surveys and interviews throughout the school year, external trainer reviews, administrator reviews, and coaching and school visits;
- **Administrators**: surveys and interviews throughout the year; and
- **Family and Community Partnership:** surveys and interviews throughout the year.

Dewdney attributes the success of Baltimore's Tools implementation to PD and coaching that helps teachers understand how to differentiate and scaffold the curriculum. With funding from the Kellogg Foundation, Tools developed iScaffold, an on-demand platform for teachers with four different entry points for exploring activities, including a graphic novel, videos, a manual, and a map of developmental trajectories.

"This platform allows teachers to access how and when they learn best," said Leong. "There is a 'do not panic button' on the site, and if teachers have a question, the Tools rep for their district will respond."

Principals and families are also a key part of Tools implementation.

"Principals need to be trained, too," said Dewdney. "If the principal who is responsible for fidelity and rating teachers and offering instructional feedback doesn't understand what's instructionally best for 4-year-olds, the system breaks. So much of what teachers and principals are taught is rigorous is actually not what children need."

Spacciapoli said that Tools training for administrators helps to create buy-in.

"Tools actually gives administrators a sense of what high-quality early childhood education should look like," she said. "Where I've seen really strong implementation is admins who trust their teachers and ensure that they can have time off for their PD, coaching, professional learning communities, and planning."

## A CLOSER LOOK: TULSA PUBLIC SCHOOLS

Tulsa Public Schools recently selected Tools of the Mind as its district pre-K curriculum across 46 schools. First, a selection committee used the district's research-based rubric to narrow the field to its top seven choices. Then, the district made those curricular materials available to all teachers and held two days of open houses with the companies. Every pre-K teacher in the district was surveyed and asked to rank their choices. The survey helped the committee select the top three finalists.

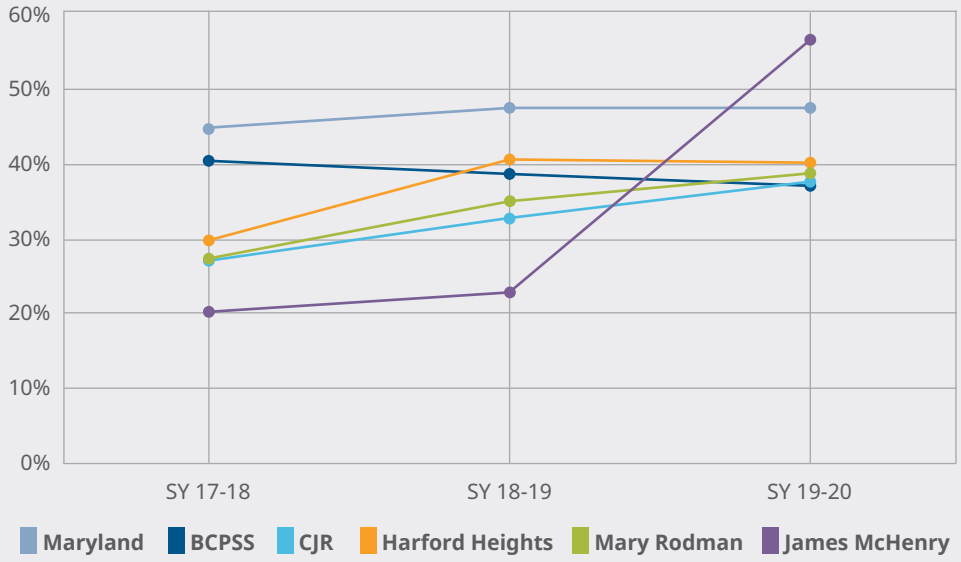
As part of the selection process, Tulsa teachers visited Denver Public Schools to observe Tools classrooms and talk to pre-K and kindergarten teachers about their experience with the curriculum.

"Denver teachers saw such a difference in the students who had Tools for pre-K in terms of kindergarten readiness," said Jenny Taylor Okonkwo, Tulsa Public Schools program manager for early childhood education. "That really resonated with our teachers as well."

The committee ultimately selected Tools after two days of in-depth presentations by the three finalists.

Kindergarten readiness assessment data for the past three school years shows increased readiness for kindergarten among schools with a Tools pre-K program that outpaces the BCPSS district and Maryland state averages. Kindergarten readiness at schools with a Tools pre-K program grew 5.3 percentage points in year one and 10.8 percentage points in year two.

Figure 4: Percent of All Students Demonstrating Kindergarten Readiness




| Group | Demonstrating Readiness SY17-18 (Pre-Tools) | Demonstrating Readiness SY18-19 (first year implementing Tools) | Demonstrating Readiness SY19-20 (second year implementing Tools) |
|---|---|---|---|
| MD State (per MSDE public data) | 45% | 47% | 47% |
| BCPSS (per MSDE public data) | 41% | 39% | 37% |
| CJR | 28.1% | 31.0% | 38.4% |
| Harford Heights | 31.8% | 41.6% | 40.6% |
| Mary Rodman | 28.3% | 35.1% | 39.4% |
| James McHenry | 22.6% | 24.2% | 56.6% |

Source: MSDE and Baltimore City Public Schools data profiles

In our early childhood classrooms, we're committed to creating excellent learning experiences for students, ensuring that all students have equitable access to excellence. Children engage in intellectually stimulating, culturally responsive experiences and joyful, purposeful play to promote their academic, oral language, social-emotional and physical development. Learning is fostered in partnership with families and caregivers to nurture children's growth and well-being.

Vision of Excellence for Early Childhood in Tulsa Public Schools

The 2020-2021 school year was the first year for implementation. The district introduced the curriculum through distance learning, which presented some challenges.

"The beginning of the year was quite challenging," Okonkwo said. "Tools is not designed to be virtual, and 4-year-olds are not great on Zoom."

Still, Tulsa teachers and coaches rose to the occasion. Coaches developed modules on the Canva graphic design platform and recorded daily lessons for teachers to deliver. The district dedicated significant PD time to Tools beginning in June 2020 and continuing throughout the year.

Okonkwo said that Tulsa teachers particularly liked the Virtual Classroom that Tools developed (with support from LEGO) for remote learning and the Parent Connect portal. Tulsa has a high proportion of ELL students, and teachers loved being able to message parents in their native languages.

Okonkwo cautioned that while the "just in time" PD model is great for some teachers, more veteran teachers may need to see the full picture upfront to buy in.

"COVID-19 interfered with our plans for overall messaging of the new curriculum," she said. "I would tell other districts that they should offer really strong framing for teachers that acknowledges what is going to feel really different from what they're used to and explains why it will work and what will happen if they trust the process. For our teachers, the biggest departure is that we're not starting out teaching letter names. Teachers didn't know there were issues with that approach or what the science says now."

Tulsa pre-K teachers concurrently took a science of reading course as they were implementing Tools, and Okonkwo said that really helped the "sounds-first" approach used by Tools (as opposed to letter names) click for them.

She also recommended that Tools better communicate how math is incorporated into the daily schedule. Tulsa developed its own training to help teachers enhance math and literacy in the make-believe play block.

"There are only 15 minutes of math and science full group on the schedule each day," Okonkwo said. "Principals were asking, where's the math? Tools should advertise better that

math happens all throughout the day. Every instructional block has so many elements of literacy and math, elements of counting, matching, sorting."

When teachers and administrators are unsure about the program, Tools representatives work hard to connect with them. In Tulsa, they formed TAG, the Tools Advisory Group, to engage the skeptics. The district identified the right people, and Tools regularly communicates with them to get their honest feedback on how things are going and what can be improved.

Tulsa has committed to Tools for six years, as stipulated in state curriculum requirements.

## *Mindful Moment*

Holistic Life Foundation (HLF) is a Baltimore-based nonprofit that has provided yoga and mindfulness education in Baltimore since 2001. Today, HLF programs serve children, youth, and adults in Baltimore and across the country in a variety of settings including schools, recreation centers, drug treatment centers, and group homes.

HLF's school-based programs directly address self-regulation, which is a pathway to strengthening working memory and cognitive flexibility. HLF's core school-based program, Mindful Moment, integrates mindfulness practices into the school day and provides a safe space for students to restore calm and regain control of their emotions. The entire school participates in up to 15 minutes of daily mindfulness sessions twice per day (less for younger students), once at the beginning of the day and once in the middle of the day. This in-classroom practice begins with breath work and ends with guided silent reflection. Mindfulness practice is presented through recordings played over the school's public address system. Mindful Moment instructors enlist students, teachers, administrators, and others to record the guided practice sessions. Instructors also visit classrooms to teach and reinforce practice and model patience and calm for students.

As part of the program, HLF also maintains a Mindful Moment Room at each participating school. The room is equipped with meditation cushions, yoga mats, artwork, small water features, plants, comfortable lighting, and other soothing décor. Students may self-refer or teachers may send distressed or disruptive students for individual assistance with emotional self-regulation through yoga, breath work, self-reflection, and meditation. Students visit for 20 minutes and then return to class. The room serves as an alternative to suspension.

### A CLOSER LOOK: MINDFUL MOMENT BALTIMORE

HLF piloted Mindful Moment at Patterson High School in 2013 and then expanded the program to Robert W. Coleman Elementary School in 2014. Mindful Moment is operating in five Baltimore City schools serving 3,500 students in the 2021-2022 school year.

According to Holistic Life Foundation, 70% of Mindful Moment schools see a reduction in suspensions.

"We started collecting data and looking at suspension numbers. They were drastically reduced. That's what drew other principals in," said HLF Co-Founder Ali Smith.

Indeed, students are often referred to the Mindful Moment room for being disruptive, fighting, or struggling to pay attention. The room is staffed by one to two HLF teachers throughout the day. Those HLF guides get students talking to understand the circumstances at school or home that are preventing them from fully participating in school.

"We get acquainted, ask them about themselves," said Kellie Green, the Mindful Moment teacher at Liberty Elementary School. "We get into why they were sent to the room. We may ask them, 'did you get enough sleep? Is there anything else going on that's distracting you?'"

Based on what they hear from students, HLF staff members then teach or reinforce breath and movement tools, and talk about when and how students can use them.

"We have this set of breathing exercises and movements that have different benefits," Green said. "The 'stress breath' helps to stimulate the vagus nerve for focus and decision-making. If we have a student coming from gym class where they were in a fight, we do the 'taco breath' or the 'bigfoot breath' to help cool down the body and get their heart rate down. If they have a lot energy, we use movement to tire them out."

The goal is to help students regulate on their own, not visit the room regularly. HLF staff members use a tracking sheet that captures a student's name, grade, the time of day, and reason for their visit to the room, along with the exercises they do. On the back of the paper, students use a Likert scale of emojis to capture how they feel when they come into the room and how they feel when they leave.

"We're able to see the frequency of an individual child coming in and if the reasoning is the same every time," Green said. "If the child is falling asleep every other day, we engage the school social worker or talk to the parent to find out what's going on."

Mindful Moment instructors are hired, trained, and employed by HLF, not the school district. Instructors receive at least five full days of training, typically spread across two to three weeks in the summer. They learn the practices and the benefits of each practice as well as different ways to implement. They also learn best practices for communicating with parents and students.

At Liberty Elementary School, teachers and administrators engage students who are struggling to stay on task to help lead the program.

"We work with them the most and have more 1:1 sessions with them," Green said. "In a matter of weeks or months, you notice that kids are learning to communicate better with each other and the adults in the school."

The principal asks these students to run the morning announcements, and Mindful Moment staff hold special "lunch bunch" meetings with them to find out what's going on in the school and how they are acting in heated moments.

"If you give a kid something to do, they focus on that and not on doing something disruptive," Green said. "They want to do their job. We try to give them responsibilities so they will be better helpers."

HLF offers a formal Mindful Ambassador training for high schools. According to HLF, interested ninth grade students are progressively trained to lead Mindful Moment, be confident Mindful Ambassadors through encouragement and mentoring, and foster a student-led culture of mindfulness within the school and out. Ambassadors help to run the program and model its values for the student body, further rooting it in a school's culture. Mindful Ambassadors may graduate to enter

## Tracking Outcomes

While it has mostly focused on suspension rates and tracking forms, HLF is currently building out a suite of evaluation tools for Mindful Moment. These include a start-up request form to gather baseline data on attendance, suspensions, and office referrals as well as data published by the district on school climate. Additionally, HLF began administering pre-/post-surveys for administrators, teachers, and students during the 2020-2021 school year.

"During the pandemic, we added in 'I feel happy' as a prompt for students. There were a number of kids reporting 'not at all' on that prompt, which was troubling," said Nicole Humphreys, HLF program director for Maryland and Washington, D.C. "After they've completed a school year in the program, we will ask them that question again as well as others designed to assess if they better understand their emotions, how to use the tools they've learned, and how they benefit from them."

HLF's Workforce Development program. HLF's goal is to have alumni from a school or neighborhood ultimately lead the Mindful Moment program.

### A CLOSER LOOK: FLEXIBLE HLF MODELS IN OTHER LOCATIONS

In addition to Mindful Moment, HLF offers two other program models for school districts: Bridging Academics and the Mind and Train the Trainer.

A new virtual PD program allows teachers anywhere to learn the HLF model and bring it into their classrooms. Bridging Academics and the Mind (BAM) uses animations of HLF's three co-founders to teach its 11 core practices through an online, on-demand platform that teachers can play directly in their classrooms.

"We wanted to scale, but it's hard to get on the PD calendar," said Co-Founder Smith. "With BAM, we can help teachers develop a personal practice and give them a playbook for how to use it. It's as simple as, if your class is stressed out, play these three practices. If they are bouncing off the walls, use these. If energy is low, try these practices."

Baltimore County Public Schools used BAM in all of its classrooms for the first time in the 2020-2021 school year. HLF is measuring its use to determine next steps with the program.

Dorchester County Public Schools in Maryland opted into HLF's Train the Trainer program, hiring the organization to train its social workers, school counselors, educational specialists, and administrators to deliver the Mindful Moment program at all county schools. Educational specialists will staff the Mindful Moment room and support classroom push-ins as needed. The district also purchased the BAM program as an adjunct offering to support the overall implementation.

Kawana Webb, Dorchester County Public School's mental health services coordinator/ social work services supervisor, will oversee the program and ensure all sites are equipped. She

will meet monthly with educational specialists and the HLF trainer to provide ongoing support and PD.

"We haven't had issues with buy-in," Webb said. "Everyone is excited because they know that the punitive approach isn't working. It's not helping them stay in school and get college and career ready. We want to be proactive instead of reactive."

HLF is also doing a satellite program at the Akwesasne Reserve that stretches from New York into Canada. Two HLF staff members are in residency at the reserve for a year to help establish the program in seven schools.

## COST TO SCALE EF PROGRAMS

With promising results in Baltimore and in similar districts, ACTIVATE, Tools of the Mind, and Mindful Moment warrant consideration for expansion in Baltimore. Baltimore City Public Schools has a history of piloting new interventions in a subset of schools. Currently, the district has 27 Literacy Intensive Learning Sites and 20 SEL Intensive Learning Sites. These schools receive extra resources and supports, typically including an extra dedicated staff person. This section explores the costs of expanding the three featured EF programs into 20 additional schools (ACTIVATE and Mindful Moment) and 20 additional classrooms (Tools of the Mind).

### ACTIVATE

ACTIVATE requires teacher training, licenses for each individual student, and devices (any tablet or computer). ACTIVATE's prices are volume-dependent—the more licenses a district buys, the more affordable the program becomes per student. Creator Dr. Bruce Wexler said that ACTIVATE will match iReady's pricing per student. He offered, "If you're only trying it for 1,000 kids it's going to be about $90/child a year for [the program,] all assessments, and results. By comparison, for an individual psychologist to do the [included] assessments once, it would cost about $4,000 per child."

For 20 schools with an average of 400 students per school, 8,000 licenses would be $45/child or $360,000 total. Teacher training is an additional charge and can be done remotely or onsite. Online training for 20 schools would cost an additional $7,500. In-person training would include added travel costs for trainers. Participating students and teachers need computer or tablet workstations to participate in the intervention.

License fees include access to the student data portal. ACTIVATE provides ongoing technical support at no extra charge. For a 20-school

Table 2: Estimated Cost to Implement ACTIVATE

| Project Item | Cost for 20 additional schools | Cost per student across 20 schools |
|---|---|---|
| Teacher training | $7,500 | — |
| Individual student licenses (8,000) | $360,000 | — |
| **Total YR 1** | **$367,500** (not including devices) | **$45** |

implementation, ACTIVATE would meet monthly (at no charge) with a district-level project manager to provide custom data files for all schools and the district as a whole for discussion with the district project owner. The costs below do not include additional on-site staffing for technical support or additional training, which is considered necessary for successful implementation based on interviews with district leaders.

## Tools of the Mind

Leaders at the 100% Project have prepared a detailed proposal for scaling Tools of the Mind to 20 additional pre-K classrooms (not entire grades within a school). The three-year project includes teacher stipends for professional development, a dedicated program director/coach, and additional staffing for curriculum development and teacher support. Teachers receive 30 hours of PD in year one, 12 hours in year two, and six hours in year three.

This project also funds the materials for each classroom, including one curriculum manual per classroom; one Tools of the Mind Plan Book; and a year-long Classroom Essential Subscription Package, which provides access to Tools of the Mind digital resources including: eTools, iScaffold, Family Connect, Learn@Home (an at-home learning platform), and the Developmental Writing Assessment app (a tablet-based platform that captures children's writing processes on the screen in a video format).

## Mindful Moment

As previously described, HLF offers a variety of Mindful Moment program models to suit a district's needs. Various schools in Baltimore City are currently implementing the "full" program as well as the "lite" and "extra lite" versions, primarily based on budget. Because the district already has 20 SEL Intensive Learning Sites with Wholeness Rooms, there are opportunities for HLF to offer lighter-touch programming that complements the district's existing efforts. Note: All pricing is for Maryland schools. Out-of-state schools and districts have unique pricing.

Table 3: Estimated Cost to Implement Tools of the Mind

| Project Item | Cost for 20 additional schools (30 total) | Cost per student across 20 schools (600 students) |
|---|---|---|
| Teacher stipends for professional development course | $24,000 | — |
| Program Director/Coach | $16,000 | — |
| Curriculum Development and Support | $90,000 | — |
| **Total YR 1** | **$130,000** | **$217** |
| Total YR 2 Estimate | $70,000 | $117 |
| Total YR 3 Estimate | $50,000 | $83 |

Table 4: Estimated Cost to Implement Mindful Moment

| Project Item | Cost per school | Cost for 20 schools | Cost per student across 20 schools (based on average school size of 400 students) |
|---|---|---|---|
| **Full Program**<br>2 staff members<br>at 7.5 hrs/day<br>185 days<br>Includes Full Ambassador Program (multiple sessions weekly) | $134,000 | $2.68 million | $335 |
| **Lite**<br>1 staff member at<br>7.5 hrs/day<br>185 days<br>Includes Ambassador Program extra Lite<br>(1 session weekly) | $46,000 | $920,000 | $115 |
| **Extra Lite**<br>1 staff member at<br>4.5 hrs/day<br>185 days | $28,000 | $560,000 | $70 |
| **Train the Trainer**<br>8 hours of training<br>for classroom staff<br>and administrators;<br>all program materials;<br>monthly meetings<br>with HLF | $35,000 | $130,000 | $16 |
| **Bridging Academics and the Mind**<br>(online, on demand) | $5,000 | $50,000 | $6 |

## RECOMMENDATIONS

EF programs offer an important and varied toolbox for educators to use to prepare students for learning—especially students experiencing poverty and related trauma. Emerging from the pandemic, (most Baltimore City Public Schools were in remote learning for over a year), students and teachers alike can benefit from an enhanced focus on brain-friendly learning.

Schools are already receiving an infusion of federal stimulus dollars that have the potential to dramatically change K-12 education and improve equity over the next few years. In 2020 and 2021, Congress passed three stimulus bills that provided nearly $200 billion in K-12 aid through the Education Stabilization Fund. Baltimore City Public Schools will receive nearly $50 million from the Elementary and Secondary Schools Relief Fund (ESSER I) (to be spent by September 30, 2022) and is planning for nearly $200 million from ESSER II (to be spent by September 30, 2023), and nearly $450 million from ESSER III (to be spent by September 30, 2024) for a total of around $700 million in stimulus dollars over three years.

School districts may use ESSER funds to support any activity authorized by the Elementary and Secondary Education Act—a highly flexible opportunity. BCPSS gathered input from key stakeholders to develop Reconnect, Restore, Reimagine, a multi-year plan to guide the use of stimulus funds in service of accelerating and personalizing learning and supporting the needs of the whole child. As of publication, BCPSS has not identified executive function programs as a priority for stimulus spending.

Mental health emerged as a top community priority for the funds, and BCPSS has allocated $6 million of its ESSER I allocation to social-emotional learning and mental health services. The district has also prioritized reimagining scheduling and instructional models to ensure time for small group instruction and personalized learning. These priorities open the door for an enhanced focus on executive function in the district in alignment with the recommendations that follow.

### 1. Offer districtwide PD on executive function.

Baltimore City Public Schools has offered teachers training on the science of learning and trauma-informed practices, both of which are strongly connected to EF. BCPSS is hoping to integrate a variety of related concepts into a cohesive set of trainings for teachers.

Additional training in brain literacy/EF can empower educators to understand the fundamentals of working memory, inhibitory control, and cognitive flexibility, and how they are affected by stress.

Another way to improve brain literacy among teachers, administrators, and counselors is to help them establish their own personal mindfulness practices, including teaching staff how to breathe, meditate, and move for self-regulation and stress reduction using techniques currently offered to students.

Baltimore has a variety of homegrown resources available for brain literacy, science of learning, and mindfulness training. Holistic Life Foundation is currently providing training as part of Healing City Baltimore—a trauma-informed training program for all municipal employees. Local Tools of the Mind staff members are also equipped to deliver training on EF, and national nonprofit BrainFutures is based in Baltimore.

### 2. Invest in external evaluation of existing EF programs.

Throughout this paper, data reported by schools, districts, and program providers and testimonies of educators make a compelling case for the expansion of EF programs in Baltimore City Public Schools. Still, there is more to be learned about the conditions under

which these programs are most effective, and for whom. An external evaluation is a logical next step.

Issues of quality and fidelity were a factor in the implementation of all three programs featured in this report. As programs scale, they naturally require a deeper focus on training and preparation of facilitators, codification of program elements, and cycles of observation and continuous improvement. A study of the implementation of one or more EF programs could help the district and school leaders understand the program features and staff competencies most related to successful student outcomes.

Because EF programs are still only in select schools in Baltimore City, there is an opportunity to take advantage of natural experiments. As BCPSS continues to explore the impact of such programs, the district can use data to compare schools using EF programs with similar schools not using them on relevant academic, behavioral, school climate, and SEL measures.

Specific to Holistic Life Foundation, there are a number of iterations of Mindful Moment in use in Baltimore City Public Schools (as described in the cost section of this report). Schools typically start with a "full" implementation of Mindful Moment (two full-time staff) and then scale back as private funding wanes. Since costs are a primary concern for most schools, it would be useful to compare program outcomes across these iterations to determine if a lower-cost model is effective.

### 3. Fully vet Tools of the Mind as a possible new district pre-K curriculum.

BCPSS is preparing to launch a Request for Proposals for a new early learning curriculum in the near future. Tools of the Mind should be fully vetted and considered as a candidate, and district leaders should consider visiting Denver to see a mature implementation of Tools in action.

### 4. Use summer learning and after-school programs to pilot or expand EF approaches.

It bears acknowledgement that schools are already struggling to fit many different programs and priorities into the school day. However, after-school and summer programs are an excellent option for trying new approaches that serve school-year goals. BCPSS has budgeted $128 million in stimulus funds for summer learning alone between 2021 and 2024, in addition to a variety of other relevant line items for extended learning, personalized learning, and tutoring. Additionally, the Baltimore Children and Youth Fund and the Summer Funding Collaborative both offer grants to nonprofits for summer learning programs.

Schools and community-based organizations should consider using these funds to explore the intentional use of EF programs—both those already in use in the district and other evidence-based and promising models featured in the BrainFutures report.

As described previously in this report, EF programs using the arts as a modality have been shown to be effective. The district already partners with arts organizations such as Arts for Learning (formerly Young Audiences of Maryland), Arts Every Day, and Art with a Heart to run educational programs. These organizations may be a good fit to pilot more intentional EF approaches in their out-of-school time programs.

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**by Sarah Lohnes, MPP**

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