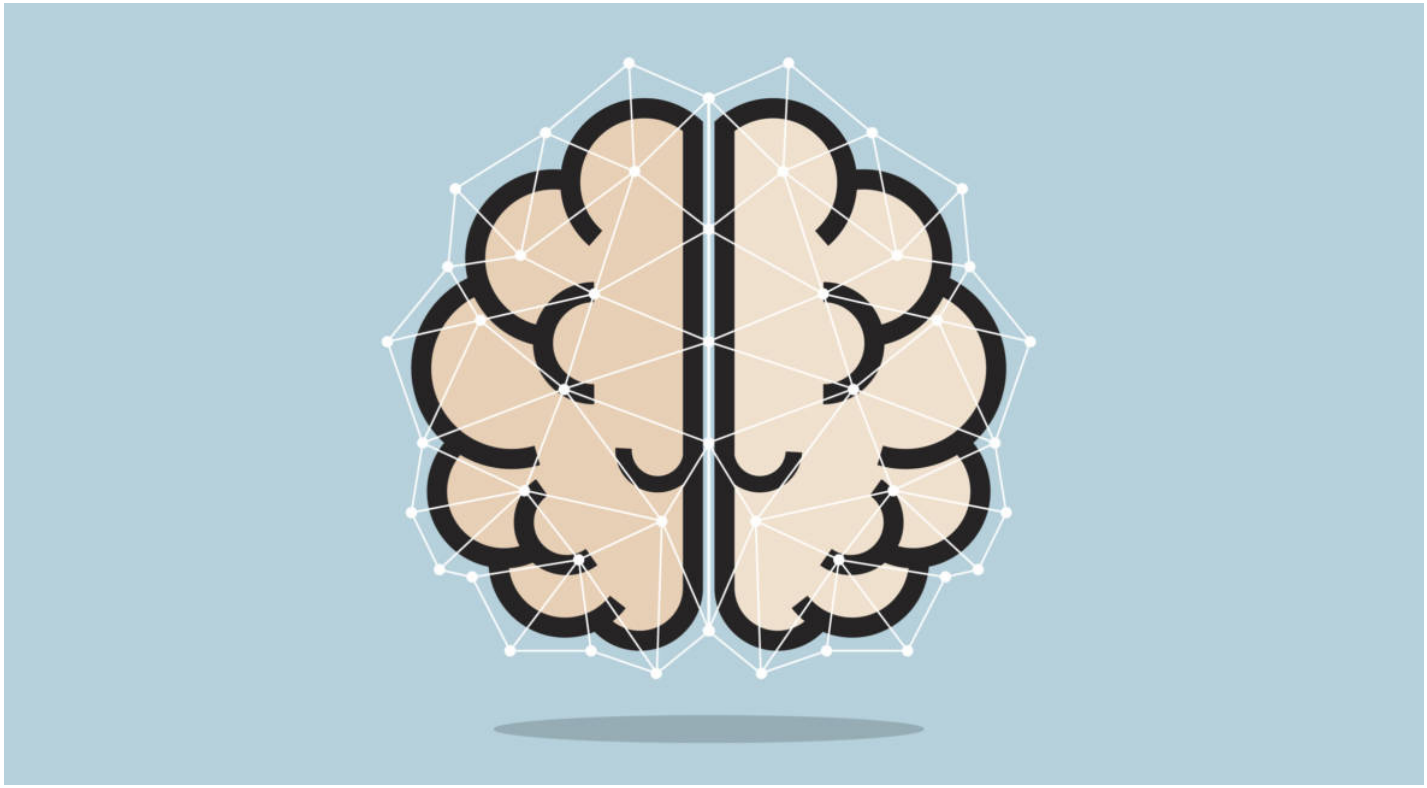
MINDSHIFT

Why Executive Function Is A Vital Stepping-Stone For Kids' Ability to Learn



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Neuroscientists and educational psychologists are constantly learning more about how children learn and the various influences beyond IQ that affect cognition. Some research, like Carol Dweck's on growth mindset or Angela Duckworth's on grit, quickly became catch phrases among educators. At the same time, critics have pushed back against the notion that students underperform only because of cognitive deficits, pointing to an equally pressing need for big changes to teaching practice. Many teachers are trying to combine the research about cognitive skills with more effective teaching practices. They are finding that whether students are working on self-directed projects or worksheets, executive functioning skills are important.

Bruce Wexler has been studying executive functioning -- a group of cognitive abilities crucial for managing oneself and information -- for the past 20 years. He first worked with adults, but he began to wonder if he could design interventions specifically for young children to get them started down a positive path before any of the negative secondary qualities associated with under-achievement -- like disengagement, low self-esteem and behavior problems -- began to manifest at school.

"The data just keeps coming in about the importance of focus, self-control and working memory for learning and life," Wexler said in an edWeb webinar. One meta-analysis of six studies found that a child's executive functioning skills in kindergarten predicted reading and math achievement into middle school and beyond. This research is particularly important because students who have poor executive functioning skills because of trauma, poverty, or diagnosed disorders are missing out on learning. Often these children haven't had a chance to develop executive functioning skills required for school before arriving there.

Many kinds of interventions can work to improve executive functioning, another reason researchers feel confident that this cognitive ability is not innate, but rather taught. Martial arts, yoga and exercise, among others, help improve students' ability to focus and control themselves. Wexler helped design his own intervention, called Activate, which uses a mixture of online games and physical activities to target focus, self-control and working memory, the skills most closely linked with academic achievement.

To test whether the program works Wexler's company, C8Sciences, took executive function tests designed by the

National Institutes of Health and made them Web-based so teachers could use them in class. These tests helped Wexler's team learn about the relative areas of cognitive weaknesses in students before using the Activate program.

"Soon it became evident that not only did we want that information, but that it was very valuable for teachers," Wexler said. It's often hard for a teacher to know when a student isn't learning something because of a lack of executive functioning capacity, because it hasn't been taught well enough, or because the student just needs more time with the content. The online diagnostic tests helped give them valuable insight to tailor their teaching.

After determining a baseline for students, Wexler's team asked teachers to use the Activate program and then tested students after four months to see how it affected their cognitive abilities. Early tests showed the training improved working memory, but Wexler was more interested in whether the training would carry over into academic achievement, so he tested third-graders from a low-income school on reading proficiency. In the test group that used Activate, 83 percent of students reached third-grade reading proficiency, compared to 58 percent districtwide. On a first-grade math proficiency test, 92 percent of students in the test group reached proficiency, compared to 63 percent districtwide. In another first-grade class at the same school that did not receive the training, only 53 percent of students reached proficiency.

"Training these executive functions leads to improvement in achievement schools," Wexler concluded. And the effects seemed to last through the summer. Another test showed

kindergartners who received the training showed better executive functioning skills when they started first grade than their peers.

When Wexler compared the effects he was seeing to other interventions -- like one-on-one tutoring, summer and after-school programming -- improving executive functioning skills had a much bigger effect. “Training a whole classroom in focus, self-control, and memory has a bigger effect on math achievement than providing one-on-one tutoring,” Wexler said. Tutoring had the next strongest effect.

Executive functioning training also seems to make a difference regardless of student IQ. “Its effect was four times as big as the differences in IQ,” Wexler said. “Of course IQ is important, but executive functioning is something we can do something about.”

SCHOOLS FOCUSING ON EXECUTIVE FUNCTIONING

Carlisle Area School District has taken the research on executive function and put it into practice, especially in K-5 schools where educators hope to improve these cognitive skills early so students don’t fall behind. District leaders started by educating teachers about different neural pathways and why problems with executive functioning could lead to problems with learning. In trainings they give teachers scenarios, and ask them to identify a student’s cognitive weakness based on behavior, and then design an intervention. They also ask teachers to reflect on their own cognitive weaknesses and where they might be able to

identify with a disorganized student or one who has a hard time staying on task.

Carlisle teachers also have a long list of strategies they integrate into the day with the whole class that emphasize brain breaks, exercise and routines. Additionally, some children need more help developing executive functioning, and educators differentiate strategies for them as well. They often talk to students about how their brain works and emphasize that when their "amygdala is hijacked," they need to stop and think about the next action rather than lashing out.

STRATEGIES

- Breathing buddies: Students lie down on the floor with a favorite stuffed animal on their chests. They slowly breathe in and out, watching the animal rise and fall. This helps students calm down when they are upset and gives them a strategy to implement when they feel themselves getting worked up.
- Teachers keep "meta boxes" in their classrooms full of fidget toys students can use to help them pay attention when they feel like they need to move.
- When transitioning between subjects or recess, teachers often play calming music and let only five kids in at a time to limit the chaos.
- Many elementary school teachers have had the experience of asking a question, seeing many hands in the air, but then calling on a student who says he forgot. That could be a working memory problem. Some Carlisle teachers are proactively addressing this

by letting those kids record their thoughts on paper or a device so they can contribute when they're called on.

- Carlisle was an early adopter of Wexler's Activate program, too. The iPad lessons focus on typical working memory games that require students to remember the order of things, progressively getting harder as the game develops. The physical games reinforce the online learning with social interactions that help embed the memories in movement. Mass ball is one game that requires students to throw a ball in a specific sequence. Students have to juggle paying attention to the order and catching the ball.
- Carlisle teachers also have students do a lot of balancing games, which help with executive functioning. Teachers might ask students to walk on a line balancing bean bags on their heads or to do the same walk on tiptoe. Teachers also use relay races to get kids moving, since exercise alone helps with executive functioning.

Adults have an attention span of about 12 minutes with a fully developed executive functioning system, so it's no wonder kids can't focus without a break. "It cannot be overemphasized that all of us need to be thinking about taking information in smaller chunks," said Malinda Mikesell, the reading supervisor for the Carlisle Area School District. She said kids need an opportunity to do something with the information on their own before having the chance to reset for the next chunk of information.

"We have mature executive function systems as adults, so we have to be careful that we're not putting our perspective onto very immature executive functioning systems," Mikesell said. She also emphasized that teachers in her district have successfully involved parents in their effort to improve executive functions, educating the adults about the brain and what cognitive weaknesses look like. Often parents have noticed the same lack of short-term memory, difficulty focusing, and disorganization affecting kids at school, and are happy to learn tips to help their child.

Mikesell said Carlisle is in the early stages of evaluating data on how well their approach is working. Early data showed that kids in the Activate program were outperforming peers not in the program on reading tests. Teachers are also reporting stories about disorganized students improving, who never had what they needed for the day or activity. Now those students are able to follow the classroom routines and are benefiting from checklists and visual organizers that teachers put together to help them with their working memory weaknesses.

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