



Teacher's Guide to Executive Functions



LearningWorks
for Kids





What are Executive Functions?

Executive functions are defined as brain-based capacities and skills that help individuals manage thinking, behavior, and feelings. In the classroom, executive functions help with figuring out what to do, how to do it, and when to do it.

Executive functions call upon the prefrontal cortex of the brain to help with a variety of skills required in the classroom, such as goal setting, critical thinking, self-regulation, and decision making. Executive functions include a set of related skills that help prioritize and orchestrate one's thoughts and behavior. Executive functions help people to monitor their behavior and attend to their experiences from the past and present.

Psychologists such as Russell Barkley, Thomas Brown, and Peg Dawson and Richard Guare have described executive functions in a variety of terms. The consensus is that executive functions orchestrate various brain functions that integrate one's perceptions, experiences, cognitions, and memories toward goal-directed behavior.

We have chosen a modified version of the model described by Peg Dawson and Richard Guare as the basis for our description of executive functions. We believe that their description is an excellent fit for understanding how children use executive functions in their day-to-day lives. It is important to note that this list of executive functions is neither comprehensive nor categorical. For example, specific skills seen in planning may also be described in organization. In addition, examples of executive dysfunctions, such as problems in completing homework, often involve many executive-functioning skills such as time management, perseverance, and sustained attention.

Executive Functions Help with:

- “What to do” skills: starting tasks, paying attention, persevering, and remembering.
- “How to do” skills: planning, organizing, shifting strategies, and managing time.
- They also help people manage their perceptions, thoughts, actions, and social interactions.

There are numerous other conceptualizations of executive functioning, some of which describe a smaller but broader range of executive skills (such as those seen in the theories of Russell Barkley, Ph.D. and Thomas Brown, Ph.D.). Other researchers have described various executive skills that are supplemental to those that we use at LearningWorks for Kids. Some of these different conceptualizations and capacities identified as executive functions are detailed in the following list:

- Nonverbal working memory (maintaining mental information in the mind)
- The capacity for control and self-regulation (motor response, hindsight, retrospective and anticipatory thinking and actions)
- The ability to consider the future (to work out the consequences of one’s actions)
- Problem-recognition skills (the capacity to identify and solve problems)

- Fluency (as measured by efficient scanning, manipulation, and decision making)
- The capacity to engage in independent, purposeful, and self-serving behavior and to grasp the gist of a complex situation (goal setting and decision making)
- Hypothesis generation and testing (as required in the scientific method)
- Common sense (the ability to apply one's experience in new situations)
- Judgment and decision-making skills (the capacity for accurate appraisal and analysis)
- The ability to take in all aspects of a situation and integrate them in decision making (perspective taking and metacognition)
- Volitional skills and the capacity to formulate goals and form an intention (self-directed behavior)

The LW4K Approach to Executive Functions

In our broader LearningWorks for Kids website, we have chosen to condense the 12 executive functions into 8 Thinking Skills. The 12-function model is based upon the theories of Peg Dawson and Richard Guare and includes.

- Flexibility – The ability to be adaptable, improvise, and shift approaches to demands
- Goal-Directed Persistence - The ability to persevere with tasks that require sustained effort (part of the thinking skill of focus)
- Metacognition – The ability to self-monitor and observe (part of the thinking skill of self-awareness)
- Organization – The ability to use a systematic approach to achieve a goal
- Planning – The ability to develop a set of strategies in order to accomplish a goal
- Regulation of Affect – The ability to manage one’s feelings effectively for decision making and task completion (part of the thinking skill of self-control)
- Response Inhibition – The ability to stop or delay an action rather than display impulsive behavior (part of the thinking skill of self-control)
- Social Thinking – The ability to respond appropriately to social conditions (part of the thinking skill of self-awareness)
- Sustained Attention – The ability to maintain one’s focus and attention in the presence of distractions (part of the thinking skill of focus)
- Task Initiation – The ability to initiate a task without procrastination (part of the thinking skill of focus)
- Time Management – The ability to respond to things in a timely fashion
- Working Memory - The ability to remember relevant information and apply it to the task at hand



How Do Executive Functions Develop throughout Childhood?

Executive-functioning skills develop throughout childhood and early adulthood. Children as young as 8 months are observed displaying consciously controlled behaviors that reflect executive functions. As children get older they display increasing skill in solving problems and maintaining thoughts and images in their minds. Demands for increasingly complex executive functions arise throughout childhood, but problems in these areas may not be noticed until children reach their middle school years, when the need for skills such as organization and planning for the future become prominent.

Executive functions may be slow to develop in some individuals. In the past it was often believed that brain-based capacities could not be changed. However, recent research indicates that the prefrontal cortex is not fully developed until individuals reach their early to mid-30s. This long-term development may account in part for why some individuals choose not to “settle down” until they reach this age.

Studies indicate that the circuitry in the frontal and temporal areas of the brain shows a maturational delay in children with ADHD and problems with executive control. However, recent research linking a number of brain exercises to the development of new neural networks in the brain suggests that training can promote improvement in brain activity. Advances in neuroscience and brain imagery techniques all point to the same conclusions: that the environment, school experience, and enrichment can lead to the growth and development of brain connections; that these gains can occur over an extended period of time; and that such progress can contribute to the development of executive-functioning skills.

Such differences in developmental maturity may play an important role in the school setting with regard to varying degrees of academic success. Students who experience delays in the development of the prefrontal cortex are likely to struggle with self-management skills and encounter difficulty with school-based tasks such as long-term projects or lengthy writing assignments that require the coordination of many executive skills. These students can benefit from a proactive approach that provides training and support from parents and teachers and creates opportunities for students to practice these executive-functioning skills.

Why are executive functions important for academic performance?

A number of executive skills are easily identifiable as crucial to classroom success. For example, the executive skills of organization and planning help students to write down their homework, remember to do it, and return it to class the following day. Executive skills such as task initiation, sustained attention, and task persistence are necessary for starting and completing long-term projects.

Executive functions are also directly related to the development of many academic skills. For example, working-memory skills, used in keeping the different sounds of a word in mind while sounding it out, are a necessary component for word decoding. Working-memory skills are also required for reading comprehension, when one needs to hold in mind what has happened in previous sentences and put this together to form a cohesive understanding of text. Metacognition, the capacity to think about one's thinking, is a cru-

cial skill in the new math, when one must not only provide an answer but also explain one's thinking in arriving at the answer. Executive functions also play a role in other academic tasks, including reading fluency, written content, math computations, and note taking. This chart indicates the connections between executive functions and academic subjects and skills such as reading, writing, math, social studies, and science.

How can I determine if a student has executive-functioning difficulties?

Helping a student to improve executive-functioning skills is likely to involve a number of steps. First, it is important to assess the student's executive strengths and weaknesses. Discussion with the student's parents or the school psychologist may be helpful. We have provided questionnaires that can help you to identify some of your student's executive strengths and weaknesses. We encourage you to complete these questionnaires (available with an Educators Premium Membership) for a better understanding of the student's executive functions and to begin using some of our recommendations to improve these skills.

How can I work with students to improve their executive functioning?

Teaching executive-functioning skills requires a similar approach to teaching any other set of skills to a student. For example, teaching multiplication would require identification and demonstration of the process while relating it to previous knowledge, explanation of why multiplication is important, and encouragement and rewarding of practice of the skill in appropriate situations. Executive skills such as planning, time management, and task persistence need to be taught in a similar fashion, then discussed and practiced to become established and useful skills. Learn more about executive functions and school-based skills to help students apply them in the classroom.



Why are executive functions important for academic performance?

The importance of executive functions for learning and education is indisputable. Educators talk broadly about the need for twenty-first century skills of thinking and working creatively and collaboratively. Executive-functioning skills of planning, organization, social thinking, metacognition, response inhibition, and flexibility are the core components of twenty-first century skills.

Neuroscientists and educators have recently demonstrated the primary role that executive functions play in skills in reading, mathematics, and written language. The impact of working-memory deficits on phonological awareness, reading comprehension, and mental mathematics has been widely studied. Time management (processing speed) and organizational skills are core deficits in youngsters who struggle with written language.

There have been compelling studies suggesting that teaching executive-functioning skills to preschool and elementary school students is more important to their academic success than teaching specific academic skills. Longitudinal studies that examine the impact of

teaching preschool and elementary school students self-management and planning skills indicate that these students do far better than their peers throughout their academic careers. Unfortunately, in today's highly-regimented classroom it is exceedingly difficult to find the time and opportunities to teach these skills directly. In addition, most teachers are not trained to teach executive skills, although many of them recognize the importance of these skills for their students' academic success.

How can I work with students to improve their executive functioning?

Many classroom interventions, in addition to the use of digital technologies, are described at <http://learningworksforkids.com/> that assist children in improving executive functions. However, of primary importance is that educators recognize that students with executive dysfunctions have a brain-based reason for their difficulties and benefit from ongoing support and training. Specific strategies to help skills such as organization, planning, processing speed/time management, and self control can be found in hundreds of posts and classroom game/app guides for teachers and in our discussion resources for teachers



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