Executive functions are crucial for school success!

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Parents and teachers are often baffled when students with attention deficits, including those who are intellectually gifted, teeter on the brink of school failure. Recently researchers may have solved part of this challenging puzzle; deficits in critical cognitive skills, known as executive function, may interfere with a student's ability to succeed in school. Practically speaking, executive function deficits may cause problems for students with ADD or ADHD in several important areas: getting started and finishing work, remembering homework, memorizing facts, writing essays or reports, working math problems, being on time, controlling emotions, completing long-term projects, and planning for the future.

Although scientists have not yet agreed on the exact elements of executive function, two leading researchers on Attention Deficit Disorder, Dr. Russell Barkley and Dr. Tom Brown, have given us insightful working descriptions. Dr. Barkley describes executive function as those "actions we perform to ourselves and direct at ourselves so as to accomplish self-control, goal-directed behavior, and the maximization of future outcomes." Through use of a metaphor, Dr. Brown gives us a helpful visual image by comparing executive function to the conductor's role in an orchestra. The conductor organizes various instruments to begin playing singularly or in combination, integrates the music by bringing in and fading certain actions, and controls the pace and intensity of the music.

Although the impact of executive function deficits on school success is profound, this fact is often unrecognized by many parents and teachers. I learned the hard way with my own son that a high IQ score alone is not enough to make good grades. Early in my son's academic career, I knew something was interfering with his ability to do well in school. But it wasn't until Dr. Barkley identified the central role executive function plays in school success, that I finally understood why school was so difficult for him.

Components of Executive Function

Based upon material from Barkley and Brown, I have outlined five general components of executive function that impact school performance:

1. **Working memory and recall** (holding facts in mind while manipulating information; accessing facts stored in long-term memory.)
2. **Activation, arousal, and effort** (getting started; paying attention; finishing work)
3. **Controlling emotions** (ability to tolerate frustration; thinking before acting or speaking)
4. **Internalizing language** (using "self-talk" to control one's behavior and direct future actions)
5. **Taking an issue apart, analyzing the pieces, reconstituting and organizing it** into new ideas (complex problem solving).
Let's take a more in-depth look at just one element of executive function-deficits in working memory and recall-and their impact on school work.

**Poor Working Memory and Recall**

1. Affects the here and now:
   a. limited working memory capacity
   b. weak short-term memory (holding information in mind for roughly twenty seconds; capacity—roughly the equivalent of seven numbers)
   c. forgetfulness—can't keep several things in mind
      As a result, students:
      - have difficulty remembering and following instructions.
      - have difficulty memorizing math facts, spelling words, and dates.
      - have difficulty performing mental computation such as math in one's head.
      - forget one part of a problem while working on another segment.
      - have difficulty paraphrasing or summarizing.

2. Affects their sense of past events:
   a. difficulty recalling the past
      As a result, students:
      - do not learn easily from past behavior (limited hindsight).
      - repeat misbehavior.

3. Affects their sense of time:
   a. difficulty holding events in mind
   b. difficulty using their sense of time to prepare for upcoming events and the future
      As a result, students:
      - have difficulty judging the passage of time accurately.
      - do not accurately estimate how much time it will take to finish a task; consequently, they may not allow enough time to complete work.

4. Affects their sense of self-awareness:
   a. diminished sense of self-awareness
      As a result, students:
      - do not easily examine or change their own behavior.

5. Affects their sense of the future:
   a. students live in the present-focus on the here and now
   b. less likely to talk about time or plan for the future
      As a result, students:
      - have difficulty projecting lessons learned in the past, forward into the future (limited foresight).
      - have difficulty preparing for the future.

**Common Academic Problems Linked to ADHD and Executive Function Deficits**

Many students with ADD or ADHD have impaired working memory and slow processing speed, which are important elements of executive function. Not surprisingly, these skills are critical for writing essays and working math problems.

A recent research study by Mayes and Calhoun has identified written expression as the most common learning problem among students with ADHD (65 percent). Consequently, writing essays, drafting book reports or answering questions on tests or homework is often very challenging for these students. For example, when writing essays, students often have difficulty holding ideas in mind, acting upon and organizing ideas, quickly retrieving grammar, spelling and punctuation rules from long-term
memory, manipulating all this information, remembering ideas to write down, organizing the material in a logical sequence, and then reviewing and correcting errors.

Since learning is relatively easy for most of us, sometimes we forget just how complex seemingly simple tasks really are, for example memorizing multiplication tables or working a math problem. For example, when a student works on a math problem, he must fluidly move back and forth between analytical skills and several levels of memory (working, short-term, and long-term memory). With word problems, he must hold several numbers and questions in mind while he decides how to work a problem. Next he must delve into long-term memory to find the correct math rule to use for the problem. Then he must hold important facts in mind while he applies the rules and shifts information back and forth between working and short-term memory to work the problem and determine the answer.

To further complicate matters, other serious conditions may co-occur with ADD and ADHD. According to the recent landmark National Institute of Mental Health MTA study on ADHD, two thirds of children with ADHD have at least one other coexisting problem, such as depression or anxiety. Accommodating students with complex cases of attention deficit disorder is critical! These children are at greater risk than their peers for a multitude of school problems, for example, failing a grade, skipping school, suspension, expulsion, and sometimes, dropping out of school and not going to college.


Favorite School Success Strategies

Over the years I have collected several favorite teaching strategies and accommodations that work well for students with ADD or ADHD. So here are just a few of my favorite tips:

General Teaching Strategies

1. Make the learning process as concrete and visual as possible.
   Written expression
   a. Dictate information to a "scribe" or parents.
   b. Use graphic organizers to provide visual prompts.
   c. Use Post-it notes to brainstorm essay ideas.
   Math
   a. Use paired learning (teacher explains problem, students make up their own examples, swap problems, and discuss and correct answers).
   b. Use a peer tutor.
   (After barely passing high school and college algebra, my son made an A in calculus plus had a 100 average on tests when the professor used this strategy. At the same time, he also tutored a friend.)
   Memory
   a. Use mnemonics (memory tricks), such as acronyms or acrostics, e.g., HOMES to remember names of the Great Lakes, Huron, Ontario, Michigan, Erie, and Superior.
   b. Use visual posting of key information on strips of poster board.

2. Modify teaching methods.
   a. Use an overhead projector to demonstrate how to write an essay. (Parents may simply write on paper or a computer to model this skill.)
   b. Use color to highlight important information.
   c. Use graphic organizers to help students organize their thoughts.
3. **Modify assignments-reduce written work.**
   a. Shorten assignments.
   b. Check time spent on homework, and reduce it if appropriate (when total homework takes longer than roughly 10 minutes per grade level as recommended in a PTA/NEA Policy, e.g. 7th grader = 70 minutes).
   c. Write answers only, not the questions (photocopy questions).

4. **Modify testing and grading.**
   a. Give extended time on tests.
   b. Divide long-term projects into segments with separate due dates and grades.
   c. Average two grades on essays- one for content and one for grammar.

5. **Modify level of support and supervision.**
   a. Appoint a "row captain" to check to see that homework assignments are written down and later turned in to the teacher. Dr. Clare Jones has found this strategy effective.
   b. Increase the amount of supervision and monitoring for these students, if they're struggling.

6. **Use technology.**
   a. Use a computer as often as possible.
   b. Use software to help teach skills.

Unfortunately students with ADD or ADHD are often **punished for executive function deficits** such as lack of organizational and memory skills that interfere with their ability to bring home the correct homework assignments and books. Hopefully, after reading this article, teachers and parents will develop more innovative intervention strategies. For example, one effective alternative would be to have someone (a friend or teacher aide), meet the student at his locker to get the necessary homework materials together. Ultimately, this process of "modeling" and "shaping" behavior at the critical "point of performance" will help the student master skills or at a minimum, teach him to compensate for deficits.

Clearly school is often very difficult for students with attention deficits. However, when executive function deficits are also present, the accompanying problems are often overwhelming to the student and family. Unfortunately, some parents and teachers have had little awareness or sympathy for the challenges presented by these combined deficits. Hopefully, teachers and parents now realize that attention deficit disorder is often a very complex condition! It's much more than just a simple case of hyperactivity. When deficits in executive function and related learning problems are present, **students can try their very best and still not succeed in school!!**

So what should parents and teachers do with this new information?

**1) Identify** a) the student's specific learning problems (e.g. written expression or math) and b) their executive function deficits (e.g. working memory, disorganization, forgetfulness, or impaired sense of time) and **2) provide accommodations** in both areas!

I leave you with this food for thought,

"Succeeding in school is one of the most therapeutic things that can happen to a child!
So do whatever it takes to help the child succeed in school."

On a personal note, our youngest son struggled terribly throughout his school years with ADD inattentive and executive function issues. Although college was incredibly difficult, Alex graduated this year. We're so proud of him and his tenacity. So if your child is struggling in school, do not give up. My family offers living proof that there is hope and help for ADHD and coexisting conditions.
See the original article for references including Barkley, Brown, Dendy, Deshler, Levine, Mayes and Calhoun.

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