

Executive Functions

Definition: The processes responsible for self-direction, coordinating, and managing all other processing abilities. Executive processing includes, goal setting, planning, problem solving, self-monitoring, flexibly shifting from one activity to another, adjusting a plan when current efforts are not effective, actively monitoring and managing emotions in response to some stimulus. The ability to know when, what, and how to use a strategy as well as monitor the effectiveness of a strategy is all part of executive processing. Also included in executive processing is the ability to delay a response or initiate a response, sustain attention and persist until a task is completed. Executive functions manage the brain's cognitive functions; they provide the mechanism for "self-regulation". Refers to brain circuits that prioritize, integrate, and regulate other cognitive functions such as holding information in working memory. Individuals with working memory deficits may also have difficulty sensing the passage of time as well as have a difficult time organizing themselves across time. Use of self-talk to guide behavior, self-monitor, reflect and learn from mistakes, inhibit response and persist, and manage emotions may also be problematic.

Remediable: No; however, with cues, self-monitoring training, accommodations, and coaching individuals can minimize the adverse impact on performance.

Related areas of processing: attention, working memory, short-term memory

Impacts: Normative weaknesses in executive functions impact an individual's ability to prioritize, organize, initiate, pace, plan, sequence, and carry out an action to completion such as required in mathematics problem solving, comprehension monitoring, writing an essay, story or report. Also affected is one's ability to recognize if a plan is or is not working and adjust accordingly. There may be additional difficulty in remembering what to do in the moment or as well as imagine a solution without first experiencing or acting it out. There is difficulty in understanding and producing solutions or flexible responses in a timely way in real-world learning settings. The effect may be to try one thing and quit if it doesn't work.

READING Achievement

- Difficulty remembering earlier content in a reading passage.
- Difficulty taking a passage apart – finding key message, supporting arguments, conclusion.
- Difficulty taking a story apart – analyzing characters, remembering sequence of action.
- Sustaining attention and comprehension over long sections of text. Suppressing irrelevant associations or wandering off on tangents in thinking during reading.

MATH Achievement

- Difficulty remembering how to perform math processes (e.g., two-digit multiplication, balancing checkbook).
- Difficulty solving “story” problems – what does the problem ask, what does one need to know, what does one already know?
- Difficulty dealing with frustration when confused or wrong.
- Monitoring effectiveness of problem solving, switching course, flexibly generating a new plan.

WRITING Achievement

- Difficulty remembering rules for spelling, grammar and punctuation.
- Difficulty getting started on a writing assignment.
- Difficulty managing train of thought or coherent argument throughout a piece of writing.

Executive Functions

Additional Indicators across other environments and contexts

- At home, with peers, in the community
- Observed behaviors during assessment
- Other indicators in performance or vocational readiness

Research-based Implications for Instruction, Curriculum, Environment (ICE):**Instruction:**

- Explicitly teach organization and support **students finding and internalizing their own methods** to support independent functioning. Do scenario testing to provoke thinking of pros and cons of organizing by a particular strategy. Reflect on the effectiveness and support students explicit linking of application of organization to desired outcomes.
- When teaching students to use strategies be sure to include teaching the components of the strategies, but also when to use them, why they are helpful, and why a particular strategy may be more helpful in a set of circumstances over another.

- Use paired learning (teacher explains a problem, students make up their own examples, exchange problems and discuss answers).
- Organizing instruction around essential understandings with visual representations provides multiple points and opportunities for seeing how the pieces relate to each other and increases the likelihood of easy recall and reduces demands on working memory.
- Use reciprocal teaching, paired learning, peer tutoring with critical features implemented with fidelity. These methods can increase explicit modeling of how to think, organize, cue, and self-manage as well as teach content.
- Teach students to self- monitor and self-reward,
- Explicitly teach students to sub-vocalize and scaffold use of internal dialog to improve comprehension and self-regulation.
- Explicitly teach and require note taking strategies such as Cornell method, split page notes, etc. Methods that have a component of reflection and elaboration to activate prior knowledge and provoke further connections with new content.

Curriculum:

- Look for Universally designed curriculum that has built in visual cues and use of organizers to help organize content.. Additionally use features of materials that support comprehension monitoring, strategic approach, explicit steps in problem solving, and or self-monitoring.
- Teach strategy use across the grades systematically building complexity in student knowledge as well as range of applications. Applications across content areas and projects will increase the likelihood that students will internalize, adjust, and use them flexibly with success.
- Teach how to take notes and use sticky notes to help develop the skills of comprehension monitoring and off-loading demands on working memory.
- Use curriculum maps, or charts to help break pig picture or big tasks into more manageable chunks.

Environment:

- Display tools (e.g., spelling, grammar, punctuation, math facts and maps) on walls. Information which is used does not need to be comprehended should not use working memory.
- Use of assistive technologies to show the passage of time and explicitly teach students to feel and estimate passage of time.
- Use of notes and self-cuing strategies—explicitly teach student to think about how they will cue themselves to remember to act at the moment they need it. (e.g. leave voice messages, wall or visual calendars, externalize and prioritized “to do” lists. Use visuals or cue cards on their desk or folders that provoke learners to think strategically and exert control over their learning, “What do I need to do?” “How will I do it?” “What could get in my way and what strengths do I have that could assist me?”
- Organize environment to cue students (e.g. strategic use of word walls, visuals, etc.)
- Recognize and reward effective effort.

Recommendation for Differentiation in the General Classroom for Executive Functions: (includes changes in methods, Universal Design for Learning, process, accommodations, assistive technology, etc.)

Content	Process	Product
<ul style="list-style-type: none"> • Use visual, verbal, and physical cues to remind students to use what they know. • Teach students how to take notes. • Teach students how to plan and organize; closely monitor 	<ul style="list-style-type: none"> • Small group instruction • Breaking tasks and assignments into chunks • Teach problem solving to automaticity and provide cues • Identify strengths and weaknesses • Use of note taking aids such as a recording pen and/or outline of notes for student to add own comments. 	<ul style="list-style-type: none"> • Break projects into manageable segments with multiple points for evaluation and feedback • Minimize amount of information students must hold in working memory •

	<ul style="list-style-type: none"> • Use of outlining/mind mapping software to assist in organizing writing projects. • Use of planner, physical or electronic. • Use of voice mail, text messaging as reminders (iping.com) • Use of highlighters to organize priority information with color coding. 	
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Implications for Achieving Proficiency on State Standards

Samples of English Language Arts content standards, if unsupported, may exceed a student's attention capacities or compensatory strategies which in turn will decrease the likelihood of reaching proficiency.

- Grade 4 Speaking, Viewing, Listening, and Media Literacy Standards Comprehension and Collaboration: . . . apply strategies (e.g. problem solving, decision making) to resolve a disagreement. By grade 6 standard increases in rigor to include resolving disagreements (e.g., establishing rules using listening skills, keeping emotions in check while making decisions, problem-solving, negotiating, mediating).
- Grade 5 Language Standards: Use knowledge of language and its conventions when writing, speaking, reading, or listening to expand, combine, and reduce sentences.

- Grade 5 Writing Process: Production and Distribution of Writing Standard: Draw evidence from literary or informational texts to support analysis, reflection, and research.
 - Apply grade 6 reading standards to literature (e.g. compare and contrast texts in different forms, genres in terms of their approaches to similar themes and topics).
 - Apply standards to non-fiction (e.g. trace and evaluate the arguments and specific claims in a text, distinguishing claims that are supported by reasons and evidence from claims that are not).
- Grade 8 Reading Informational Text Integration of Knowledge: Analyze a case in which two or more texts provide conflicting information on the same topic and identify where the texts disagree on matters of fact or interpretation.
- Grade 6-8 Standards for Reading Science and Technical Content: Analyze the structure the author uses to organize a text, including how the major sections contribute to the whole and to an understanding of the topic.

Resources and Research Implicating Executive Functions Impact on Achievement

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