Research-based Approaches to Specific Learning Disability Identification and Assessment

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_Yale Child Study Center, School of Medicine*

What is the Utility of Test Results for Teachers?

Linking Assessment to Intervention
Instructional Planning is Complex and Requires a Team of Experts

Multiple Data Sources

Knowledge of and Access to Appropriate Resources

Mascolo and Flanagan (2011)

Linking Assessment to Intervention

- Requires good instruments
- Well trained clinicians
- Well trained teachers and special educators
- A mechanism in place for bringing data together to problem-solve in an attempt to offer the most effective instruction and interventions to children

Mascolo and Flanagan (2011)
Intervention Types

- Need to differentiate between
  - Direct Interventions (remediation)
  - Accommodations
  - Compensation
  - Instructional/Curricular Modifications

- **Intervention**: any technique, product, or approach that intends to address directly an identified area of weakness through remediation

- **Accommodations**: any technique or support that intends to alleviate the symptomatology associated with an identified area of weakness (e.g., circumventing the impact of a processing speed weakness via extended time - - the symptom is not “Gs deficit” – that’s the problem; the symptom is “unfinished assignments” - - when you extend time you alleviate the symptom and assignments are completed.

- **Compensation**: strategies taught to a student that he or she is expected to apply independently to by pass or minimize weaknesses

Mascolo and Flanagan (2011)

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**Manifestations of Cognitive Weaknesses and Examples of Recommendations and Interventions** (Flanagan, Alfonso, & Mascolo, 2011, 2012)

<table>
<thead>
<tr>
<th>Cognitive Abilities and Neuropsychological Functions</th>
<th>Brief Definition</th>
<th>General Manifestations of Cognitive Neuropsychological Weakness</th>
<th>Specific Manifestations of the Cognitive Neuropsychological Weakness</th>
<th>Recommendations/Interventions</th>
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<tbody>
<tr>
<td>Fluid Reasoning (Gf)</td>
<td>Novel reasoning and problem solving: ability to solve problems that are unfamiliar. Processes are minimally dependent on prior learning.</td>
<td>Difficulty with: Higher level thinking and reasoning</td>
<td>Reading Difficulties: Drawing inferences from text</td>
<td>Develop student’s skill in categorizing objects and drawing conclusions</td>
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<tr>
<td></td>
<td></td>
<td>Transforming or generalizing learning</td>
<td>Math DIFFiculties: Reasoning with quantitative information/word problems. Internalizing procedures and processes used to solve problems</td>
<td>Use demonstrations to externalize the reasoning process</td>
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<td></td>
<td>Extending knowledge through critical thinking Procedure to solve problems</td>
<td>Writing DIFFiculties: Essay writing and generalizing concepts</td>
<td>Gradually offer guided practice (e.g., guided questions) to promote internalization of procedures or processes</td>
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<td></td>
<td></td>
<td>Deriving solutions for novel problems</td>
<td>Developing a theme</td>
<td>Targeted feedback</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Understanding underlying rules or processes to solve problems</td>
<td>Comparing and contrasting ideas</td>
<td>Cooperative learning</td>
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General Manifestation of Deficit in $G_f$

- Higher level thinking and reasoning
  - Difficulties with deductive reasoning (general to specific)
  - Difficulties with inductive reasoning (specific to general)
- Transferring or generalizing learning
- Deriving solutions for novel problems
- Extending knowledge through critical thinking
- Perceiving and applying underlying rules or process(es) to solve problems

Academic Manifestations of $G_f$ Deficit

- Reading
  - Difficulties with inferential reading comprehension
  - Difficulty abstracting main idea
- Writing
  - Difficulty with essay writing and generalizing concepts
  - Difficulty developing a theme
  - Difficulty with comparing and contrasting ideas
- Math
  - Difficulties with math reasoning (word problems)
  - Difficulties with internalizing procedures and processes used to solve problems
  - Difficulty apprehending relationships between numbers
Recommendations for *Gf* Deficit

- Develop student’s skill in categorizing objects and drawing conclusions
- Use demonstrations to externalize the reasoning process
  - Gradually offer guided practice (e.g., guided questions list) to promote internalization of procedures or process(es)

Recommendations for *Gf* Deficit

- Targeted feedback
- Cooperative learning
- Think Alouds
- Reciprocal teaching
- Graphic organizers to arrange information in visual format
Targeted Feedback

• Feedback to students is important and needs to be *concrete* and *specific*
  – Highlight parts of the task that they executed appropriately
  – Identify where things went “wrong” or off-course
  – Describe how to correct the mistakes
  – Provide opportunity for self-correction and/or practice

Targeted Feedback Example

1. Read the Problem
2. Select Important Information
3. Select Operation to Use
4. Solve the Problem
5. Check your work (ask yourself: does my answer make sense?)

Ann baked 12 cookies for her school’s bake fair. She had 3 customers in her line that each wanted a cookie. How many cookies did she have left after she served the customers?

\[12 \times 3 = 36\]
Targeted Feedback Example

1. Read the Problem
2. Select Important Information
3. Select Operations to Use
4. Solve the Problem
5. Check your work (ask yourself: does my answer make sense?)

Ann baked 12 cookies for her school’s bake fair. She had 3 customers in her line that each wanted a cookie. How many cookies did she have left after she served the customers?

12
X 3

36

Feedback:
- Great job of selecting important information (numbers 12 and 3).
- Did not identify the appropriate operation (used multiplication instead of subtraction).
- I think you might have seen the word “each” first and selected multiplication, but if you read on you would have realized that the question was asking about “how many left” and could have selected subtraction.
- Focus on reading the whole problem first, then going back to re-read for what the problem is asking for.
- Also, if you checked your work, you might have seen that the answer 36 did not make sense in the context of the problem. Your computation was correct, but how could she have more cookies left than what she started with?
Targeted Feedback is Critical
For Student Success
Cooperative Learning

• Can be in pairs or small group
• Students with Gf deficits can be matched with students who have good reasoning skills and who are comfortable with “thinking aloud” and contributing to the group
• Important to assign tasks that capitalize upon student’s strengths and assist in accomplishing your goal (e.g., student who needs help with reasoning may read well)
• Feedback/Processing of experience is important

Reciprocal Teaching Cards
www.adrianbruce.com/reading/room4/recip
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www.adrianbruce.com/reading/room4/recip

3. Clarifying

Leader: "What aspects of this paragraph do you need to clarify?" (make clear)

Group Members:
- I'd like to know what the word ______ means?
- Where is __________ located?
- How is this word pronounced?

1. Questioning

Leader: "In order to check if someone has fully understood this passage, what questions could you ask them?"

Group Members:
- What...?
- Why...?
- When...?
- Which...?
- Where...?
- Who...?
- How...?

(Then the whole group answer the questions)

5. Summarizing

Leader
- "[name] would you please say / write a sentence or two to summarize this passage."

- "State the main points of this paragraph please [name]."

- "What are the most important facts / pieces of information in this paragraph [name]?"
Graphic Organizers

- Make use of graphic organizers (Venn diagrams, concept maps) to help the student
  - Understand the information conceptually through a visual modality
  - More readily link new information to known information
  - Make links from specific to general
Programs/Techniques for Gf Deficits

• When selecting a program or a technique to intervene with a student with a Gf deficit, it may be helpful to consider one that
  – includes explicit strategy instruction
  – focuses on the application of higher level thinking skills to the reading (e.g., making predictions, drawing inferences, abstracting, inferring character feelings) and writing process (e.g., persuasive writing, compare/contrast)
  – is multi-staged and includes modeling up through independent application of the strategy/technique

Reading and Writing Examples (Gf)

• Inspiration/Kidspiration software (www.inspiration.com)
  – “Created for K-5 learners, Kidspiration™ develops thinking, literacy and numeracy skills using proven visual learning principles. In reading and writing, Kidspiration strengthens word recognition, vocabulary, comprehension and written expression. With new visual math tools, students build reasoning and problem solving skills.”

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<td>Auditory Processing (G)</td>
<td>• Ability to analyze and synthesize auditory information</td>
<td>Difficulties with:</td>
<td>Reading Difficulties:</td>
<td>• Phonemic awareness activities</td>
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<td></td>
<td>• One narrow aspect of G is a precursor to oral language comprehension (i.e., parsing speech sounds or Phonemic Coding)</td>
<td>• Hearing information presented orally</td>
<td>• Acquiring phonics skills</td>
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<tr>
<td></td>
<td>• In addition to Phonemic Coding, other narrow Gs abilities include: Speech Sound Discrimination, Resistance to Auditory Stimulation Disturbance, Memory for Sound Patterns, and others related to music</td>
<td>• Initially processing oral information</td>
<td>• Sounding out words</td>
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<td></td>
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<td>• Paying attention, especially in the presence of background noise</td>
<td>• Using phonetic strategies</td>
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<td></td>
<td></td>
<td>• Discriminating the direction from which auditory information is coming</td>
<td>• Reading word problems</td>
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<tr>
<td></td>
<td></td>
<td>• Discriminating between simple sounds</td>
<td>• Spelling</td>
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<td></td>
<td></td>
<td>• Foreign language acquisition</td>
<td>• Note-taking</td>
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<td></td>
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<td>• Poor quality of writing</td>
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Academic Manifestations (Glr)

- **Language**
  - Expressive – circumlocutions, speech fillers, “interrupted” thought, pauses
  - Receptive – making connections throughout oral presentations (e.g., class lecture)
Interventions for Glr

- **Active learning** (Marzano, et al., 2001)
- **Rehearsal, overlearning, elaboration** (Squire & Schacter, 2003)
- **Mnemonics** (Wolfe, 2001)
- **Visual representation** (Greenleaf & Wells-Papanek, 2005)
- **Organizational strategies**

Wendling and Miller (2010)

Glr Recommendations

- Repeated practice with and review of newly presented information
- Teach memory strategies (verbal rehearsal to support encoding, use of mnemonic devices)
- Use multiple modalities when teaching new concepts (pair written with verbal information)
- Limit the amount of new material to be learned; introduce new concepts gradually and with a lot of context
- Make associations between newly learned and prior information explicit
- Use lists to facilitate recall (prompts)
Glr Recommendations

• Expand vocabulary to minimize impact of word retrieval deficits
• Build in wait-time for student when fluency of retrieval is an issue
• Provide background knowledge first before asking a question to “prime” student for retrieval

Programs/Techniques for Glr Deficits

• When selecting a program or a technique to intervene with a student with a Glr deficit, it is helpful to ensure that it
  – includes encoding strategies (e.g., mnemonics, visuals)
  – uses some form of strategy instruction for accessing information
Reading and Writing Intervention Examples (Glr)

• Reading
  – Teaching text structure which, “organizes the reader’s thinking, and enhances understanding and recall of the information” (Wendling & Mather, 2009, p. 108)

Reading and Writing Examples (Glr)

• Story Map
  • Type of graphic organizer that can be used to teach narrative text structure
  • Focuses on 4 elements including (1) characters and their personalities/ motivations; (2) main problem; (3) characters’ attempts to problem solve; (4) outcome/conclusion
Reading and Writing Examples (Glr)

• **Writing**
  
  – Use programs with generated word banks so that the retrieval demands during writing are lessened and vocabulary is indirectly expanded by having the student use target words in sentences (e.g., ClozePro)
Volcanoes

A volcano is an opening in the Earth’s ___ that allows hot, ____ rock to escape from ____. Most volcanoes are mountains of ____ and ash. When ____ builds beneath the surface, the volcano ____. The molten rock, called ____, explodes out of the _____. As the magma flows it becomes ____. The hot lava ____ buildings and houses. Volcanic ____ also shoot out ____ and ____. For weeks after eruptions there may be dark ____, strong ____ and heavy ___.
The text you remove is placed automatically in a 'grid'.

Run the activity, or print it as a worksheet for the whole class to use.
Using Instructional Materials (Glrl)

- Use chapter terms such as “word banks” for writing activities to facilitate retrieval
- Use chapter previews to “prime” background knowledge and help student make associations
- Use online tools (e.g., writing prompts)

Harcourt Language (Grade 4)

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<tr>
<td>Visual Processing</td>
<td>Ability to analyze and synthesize visual information</td>
<td>• Difficulty with recognizing patterns</td>
<td>Reading Difficulties: Orthographic coding (using visual features of letters to decode)</td>
<td>• Capitalize on students phonemic skills for decoding tasks.</td>
</tr>
<tr>
<td>(Vs)</td>
<td>The ability to make use of visual imagery (often in conjunction with visually organized images) to solve problems (Schneider &amp; McGrew, 2012)</td>
<td>• Reading maps, graphs, charts</td>
<td>Single-word acquisition</td>
<td>• Teach orthographic strategies for decoding (e.g., word length, shape of word). Use “cover, copy, compare” technique - go to: <a href="http://www.chicopeeprimary.com/cambrowgdc_cover%E6%9C%80%E5%BE%8Ccover.html">http://www.chicopeeprimary.com/cambrowgdc_cover最後cover.html</a></td>
</tr>
<tr>
<td></td>
<td>There are many narrow Vs abilities, some of which include Visual and spatial abilities, Speeded Rotation, Closure Speed, Flexibility of Closure, Visual Memory and Spatial Scanning</td>
<td>• Attending to fine visual detail</td>
<td>Using charts and graphs within a text in conjunction with reading</td>
<td>• Provide oral explanation for visual concepts.</td>
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<td></td>
<td>Recognizing spatial characteristics of objects (e.g., size, length)</td>
<td>• Recalling visual information</td>
<td>Comprehension of text involving spatial concepts (e.g., social studies text describing physical boundaries, movement of troops along a specified route)</td>
<td>• Review spatial concepts and support comprehension through use of hands-on activities and manipulatives (e.g., using models to demonstrate the moon's orbital path).</td>
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<td></td>
<td>Recognition of spatial orientation of objects</td>
<td>• Appreciation of spatial characteristics of objects</td>
<td>Mathematical abilities: Number alignment during computations</td>
<td>• Highlight margins during writing tasks.</td>
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<td></td>
<td></td>
<td>(e.g., spatial characteristics of objects)</td>
<td>Reading and interpreting graphs, tables, and charts</td>
<td>• Provide direct handwriting practice.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Writing Difficulties: Spelling right words</td>
<td>Writing Difficulties: Spatial planning during writing tasks (e.g., no attention to margins, words that overlap a line)</td>
<td>• Use graph paper to assist with number alignment.</td>
</tr>
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<td></td>
<td></td>
<td>• Spatial planning during writing tasks (e.g., no attention to margins, words that overlap a line)</td>
<td>Inconsistent size, spacing, position, and slant of letters</td>
<td></td>
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Reading and Writing Examples (Gv)

- Writing
  - Cover, Copy, and Compare

<table>
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<tr>
<th>Trace</th>
<th>Copy</th>
<th>Recall</th>
</tr>
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<tr>
<td>chopping</td>
<td>_______</td>
<td>_______</td>
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<tr>
<td>product</td>
<td>_______</td>
<td>_______</td>
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<tr>
<td>knock</td>
<td>_______</td>
<td>_______</td>
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<td>jogging</td>
<td>_______</td>
<td>_______</td>
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<tr>
<td>dodging</td>
<td>_______</td>
<td>_______</td>
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<td>cotton</td>
<td>_______</td>
<td>_______</td>
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<tr>
<td>forgotten</td>
<td>_______</td>
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</table>
How to Use Instructional Materials

• Visual Features of texts (maps, graphs, models)
• Graphic Organizers online
• “Using Tables, Charts, and Graphs” in Harcourt Science text
Johnny has perceptual-motor, graphomotor difficulties – OT intervention seems warranted; needs visual supports

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<td>Processing Speed (Gs)</td>
<td>Speed of processing, particularly when required to focus attention for 1-3 minutes. Usually measured by tasks that require the ability to perform simple repetitive cognitive tasks quickly and accurately. Some Gs abilities include Perceptual Speed, Rate-of-Test-Taking, Number Facility, Reading Speed, and Writing Speed (note that the latter two abilities are also listed under other broad CHC domains, including Gm).</td>
<td>Difficulties with: Efficient processing of information; Quickly perceiving relationships (similarities and differences between stimuli or information); Working within time parameters; Completing simple,rote tasks quickly.</td>
<td>Reading Difficulties: Slow reading speed, which interferes with comprehension; Need to read for understanding; Math Difficulties: Automatic computations, Computational speed in slow despite accuracy, Slow speed can result in reduced accuracy due to memory decay; Language Difficulties: Amount output due to time factors, Speech output due to time factors, Extended time to produce language output due to time factors, Reduced output due to time factors, Reduced output due to time factors; Writing Difficulties: Limited output due to time factors, Labored process results in reduced motivation to produce language output due to time factors, Limited output due to time factors, Reduced output due to time factors.</td>
<td>Repeated practice, Speed drills, Online activities/games (e.g., <a href="http://www.academic-skills.com">http://www.academic-skills.com</a>), Computer activities that require quick, simple decisions.</td>
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Reading and Writing Examples (Gs)

- Writing
- Wordy Qwerty from Talking Fingers

The overall purpose of Wordy Qwerty: Foundations for Reading and Writing Fluency, is to improve phonological and morphological sensitivity, to develop a deeper understanding of how words are constructed in English, and to provide reading and writing activities with helpful feedback, in order to increase fluency and comprehension in reading and writing. Wordy Qwerty has 20 lessons, with six activities per lesson, that present the following foundations for fluency:
Increasing Fluency in Writing

Write Stories: In these cleverly illustrated 8-line rhymes, children hear and see the first line, and have to type out the second line after it is dictated. They can see and hear the dictated line as often as they need, but get more points if they remember the sentence and try to spell the words correctly. These little stories are full of words that require using the spelling rule just presented.

http://www.arcademic.skillbuilders.com/games/
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<tr>
<td>Short-Term Memory (Gmi)</td>
<td>Ability to hold information in immediate awareness and use or transform it within a few seconds.</td>
<td>Difficulty with: Following multi-step oral and written instructions. Remembering information long enough to apply it. Remembering the sequence of information. Retaining information. Maintaining one's place in a math problem or train of thought while writing.</td>
<td>Reading difficulties: Reading comprehension (i.e., understanding what is read). Decoding multi-syllabic words. Quickly retelling or paraphrasing what one has read. Math difficulties: Retaining memorization of facts. Remembering mathematical procedures. Multi-step problems and regrouping. Extracting information to be used in word problems. Writing difficulties: Spelling multi-syllabic words. Redundancy in writing (word and conceptual levels). Identifying main idea of a story. Note taking.</td>
<td>Use meaningful stimuli to assist with encoding and allow for experiential learning (i.e., learning while doing). Provide opportunities for repeated practice and review. Provide supports (e.g., lecture notes, guided notes, study guides, written directions) to supplement oral instruction. Break down instructional steps for student. Provide visual support (e.g., timelines) to support acquisition of basic math facts. Outline math procedures for student and provide procedural guides or flashcards for the student to use when approaching problems. Highlight important information within a word problem. Have student write all steps and show all work for math computations. Use writing programs or techniques that emphasize drafting first (e.g., Draft Builder 6). Teach chunking strategies.</td>
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<td>Attention</td>
<td><em>Attention is a complex and multifaceted construct used when an individual must focus on certain stimuli for information processing. In order to regulate thinking and to complete tasks of daily living such as schoolwork, it is necessary to be able to attend to both auditory and visual stimuli in the environment. Attention can be viewed as the foundation of all other higher-order processing. Attention can be divided into five subareas: selective focused attention, shifting attention, divided attention, sustained attention, and attentional capacity (Miller).</em></td>
<td><em>Easily distracted; lacks attention to detail; makes careless mistakes; difficulty discerning demands of a task (e.g., where to begin or how to get started); may only be able to attend to task in short intervals; difficulty changing activities; difficulty applying a different strategy when task demands change; difficulty attending to more than one thing or task at a time; cannot perform well with faced with multiple stimuli or an abundance of detail.</em></td>
<td><em>Reading Difficulties: Leans one’s place easily; easily distracted while reading; does not pick up important details in text.</em></td>
<td><em>Provide a quiet place to work in the classroom during schoolwork.</em></td>
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<td><em>Provide reinforcement for timely completion of work.</em></td>
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<td><em>Make sure student understands oral directions and has the same directions in written form for reference.</em></td>
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<td><em>Provide a cue when transitioning.</em></td>
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<td><em>Work with student to develop a time line for longer assignments.</em></td>
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<td><em>Allow student to use a computer or dictate longer assignments.</em></td>
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<td><em>Provide student with a monitor with whom he or she can check in with once or twice a day (e.g., keeping track of assignments, books, schedule).</em></td>
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<td>Executive Functioning</td>
<td><em>Executive functioning is often understood as two broadly conceptualized terms that are related to the brain’s frontal lobes: cognitive control and behavioral/emotional control. The cognitive aspects of executive functioning include concept generation (Gx/Gb), problem solving (Gf), attentional shifting (attention; Gx), planning, organizing, working memory (Gm), and retrieval fluency (Gb). The behavioral/emotional aspects of executive functioning relate to the inhibitory controls of behavior (e.g., impulsivity, regulation of emotional tone, etc.) (see Miller, 2010; KIDS Inc.).</em></td>
<td><em>Difficulty with: organizing new activities; generating concepts, and solving problems; identifying goals and setting goals; planning (e.g., larger project without necessary milestones; does not allow sufficient time to complete task); sequencing (e.g., may skip steps in multi-step problems); prioritizing (e.g., does not use what is important when making notes); organization (e.g., leaves important papers, files to turn in completed work; incomplete schedule); sustaining (e.g., has difficulty getting started, once started, does not sustain effort to complete homework; does not sustain effort to complete homework due to internal motivation); shifting between activities flexibly; coping with unforeseen events; self-regulation (e.g., does not check to ensure that each step was completed; does not check work before submitting it); social control (e.g., may exhibit inappropriate or overreactive response to others).</em></td>
<td><em>Reading difficulties: sequencing; telling a story chronologically; prioritizing; extracting main idea and other important information; problem solving; drawing inferences from text.</em></td>
<td><em>Assist student in organizing work by explaining (verbally and in writing or through visuals) the steps necessary to complete a task.</em></td>
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<td><em>Use visual schedules and build in time throughout the day to review.</em></td>
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<td><em>Use graphic organizers.</em></td>
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<td><em>Set alarm (on watch or computer) to regulate timing of projects and tasks.</em></td>
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<td><em>Plan and structure transition times and shifts in activities.</em></td>
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<td><em>Break long assignments into smaller, mini-assignments and provide time frames for completing each.</em></td>
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<td><em>Organize work space and minimize clutter; do this on a daily or weekly basis.</em></td>
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<td><em>Make a checklist for getting through assignments. For example, a student’s checklist could include such items as: get out pencil and paper; put name on paper; put due date on paper; read directions, etc.</em></td>
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</table>

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