
Executive Function in the Classroom

*Embedding Strategy Instruction
into Daily Teaching Practices*

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The strategies gave me a structure so that I could put boundaries and parameters around those whizzing little molecules in my mind and turn them into something that really made sense.

—BRANDON, COLLEGE GRADUATE

As we enter the 21st century, with its reliance on rapid communication, advanced technology, efficient media, and fast access to vast sources of information, the importance of teaching executive function processes such as planning, organizing, prioritizing, and self-editing has become more evident. Even in the elementary grades, teachers require students to complete long-term projects, lengthy writing assignments, and open-book tests that rely heavily on efficient executive function processes. Nevertheless, students are not taught these executive processes systematically, and classroom instruction tends to focus on the content or *what of*

learning rather than the process or *how*, leaving many students overwhelmed and frustrated. The critical importance of addressing these executive processes through systematic strategy instruction has become increasingly evident over the past decade.

This chapter builds on current definitions and theoretical paradigms of executive function processes (see Chapters 1–4) and provides a rationale for teaching strategies that address executive function processes in the classroom. We focus on approaches that teachers can use to create strategic classrooms and discuss the importance of teaching strategies that enhance executive function processes such as goal setting, planning, organizing, prioritizing, shifting strategies flexibly, and self-checking.

TEACHING STRATEGIES THAT ADDRESS EXECUTIVE FUNCTION PROCESSES

So, if I had a history test I could think back to that note page and it all fitted into place—as opposed to remembering a liquefied gobble of notes that I had picked up here and there along the way.

—BRANDON, COLLEGE GRADUATE

Reading comprehension, homework, note taking, long-term projects, studying, and test taking all require students to integrate and organize multiple subprocesses simultaneously and to shift approaches frequently. Academic success in all of these content areas is dependent on students' ability to plan their time, organize and prioritize information, separate main ideas from details, monitor their progress, and reflect on their work. These core executive function processes are the underpinning of most academic work from as early as the fourth grade, when the school curriculum increasingly emphasizes performance on tasks that require the coordination, integration, and synthesis of many of these executive function processes (see Figure 5.2 in Chapter 5).

Students with weaknesses in these important processes often understand complex concepts easily but struggle to show what they know, due to difficulties with planning, setting realistic goals, prioritizing, initiating tasks, and organizing materials and information. They may also have trouble shifting strategies flexibly, monitoring their progress and time, and checking and reflecting on their work. One of the most effective ways of addressing these executive function weaknesses is through strategy instruction. As is evident from Figure 8.1, effective strategy instruction focuses on helping students to become metacognitive learners by teaching them *how* to learn. As they gain an understanding of the learning process, students are able to recognize their personal strengths and

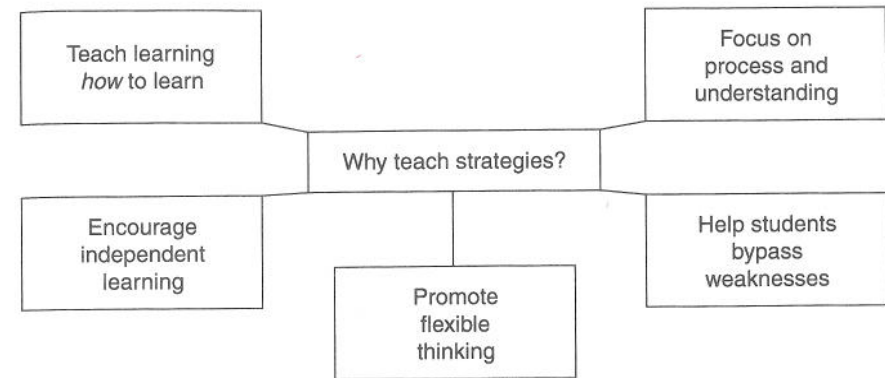


FIGURE 8.1. Purpose of teaching strategies that address executive function processes.

to realize the importance of these executive function processes for their academic success. Teaching these students strategies that address the core executive function processes allows them to become independent learners and flexible thinkers so that they can more easily bypass their weaknesses and use their strengths to learn efficiently and effectively (see Figure 8.1).

The impact of strategies on the learning process has been demonstrated in numerous studies that have shown that successful learners use effective strategies to process information (Brown & Campione, 1986; Harris & Graham, 1992; Meltzer, 1993; Palincsar, Winn, David, Snyder, & Stevens, 1993; Pressley, Goodchild, Fleet, Zajchowski, & Evans, 1989). This research has also indicated the importance of strategy instruction for enhancing students' conceptual understanding, transfer and creative use of knowledge, and ability to self-reflect about the learning process (Brown, 1997; Deshler, Schumaker, & Lenz, 1984; Pressley, Woloshyn, et al., 1995). In fact, findings have shown that explicit instruction can play a critical role in helping all students use metacognitive strategies to learn more efficiently and easily (Deshler et al., 2001; Ellis, 1997; Graham & Harris, 2003; Harris & Graham, 1996; Meltzer, Katzir, Miller, Reddy, & Roditi, 2004; Swanson, 1999a; Zimmerman & Schunk, 2001). These metacognitive strategies are beneficial for all students and are especially critical for students with learning disabilities. These students often show weaknesses in executive function processes such as planning, organizing large chunks of information, shifting mindsets, initiating new tasks, and self-monitoring (Meltzer & Montague, 2001; Meltzer, Reddy, Pollica, & Roditi, 2004; Meltzer,

Reddy, Pollica, et al., 2004). Nevertheless, there is still no clear consensus about the most effective methods for teaching students to use strategies independently and consistently.

Principles of Effective Strategy Instruction

How can strategies for enhancing executive function processes be taught effectively? Most studies have focused on evaluating the efficacy of strategy instruction for students with learning disabilities in one-on-one settings and small remedial groups rather than in general education classrooms (see Swanson & Hoskyn, 1998, for review). Recently, a few models of classroom-based strategy instruction have emerged, such as the Kansas intervention model (Deshler & Schumaker, 1988), the Benchmark model (Gaskins & Pressley, Chapter 12, this volume; Pressley & Woloshyn, 1995), and the *Drive to Thrive* approach (Meltzer, Reddy, Pollica, & Roditi, 2004). Comparisons of different interventions highlight several important principles of strategy instruction:

- Strategy instruction should be directly linked with the curriculum.
- Metacognitive strategies should be taught explicitly.
- Strategies should be taught in a structured, systematic way using scaffolding and modeling and providing time for practice.
- Students' motivation and self-understanding should be addressed to ensure generalized use of strategies.

These principles are discussed below in greater detail.

- *Strategies for teaching executive function processes should be directly linked with the curriculum.* In their meta-analysis of 51 study skills intervention studies, Hattie, Biggs, and Purdie (1996) showed that study skills programs that were separate from the curriculum "did not seem very effective." Rather, the most effective programs taught metacognitive strategies that were directly linked with the curriculum and used tasks that were perceived by students to be relevant to their classroom and homework assignments (Hattie et al., 1996). Further, embedding strategy instruction in the curriculum helped students learn and remember content material more easily and acquire efficient means of accessing information for lifelong learning (Deshler, Ellis, & Lenz, 1996; Ellis, 1993, 1994).

- *Metacognitive strategies should be taught explicitly.* While some students are able to use executive function processes independently, and even unconsciously, many need to be taught these processes explicitly. In

fact, strategies are only effective learning tools if explicit instruction is provided about *how, when, where, and why* to use them (Carnes, Lindbeck, & Griffin, 1987; Merkley & Jeffries, 2001). Thus, in order to maximize the effectiveness of strategies, it is important to incorporate explicit instruction, including teacher modeling and extended practice (Boyle & Weishar, 1999; Idol & Croll, 1987; Scanlon, Deshler, & Schumaker, 1996). Furthermore, research findings have indicated that explicit and highly structured metacognitive instruction benefits all students and is essential for the academic progress of students with learning disabilities (Deshler et al., 1996; Deshler & Schumaker, 1988; Meltzer, Katzir, et al., 2004; Paris, 1986; Pearson & Dole, 1987; Rosenshine, 1997; Swanson, 2001; Swanson & Hoskyn, 1998, 2001). Thus, instead of assuming that students know how to use learning strategies, those strategies should be discussed clearly and their importance explicitly stated (e.g., "This strategy will help you to write longer, more interesting sentences"). When students recognize the importance of making the effort to use strategies, they value these strategies, and their academic performance improves.

- *Strategies should be taught in a structured, systematic way.* Strategy instruction presumes systematic modeling, guided practice, and frequent feedback, with instruction focused on helping students internalize and generalize the strategies that are taught (Deshler et al., 1996; Meltzer, Katzir, et al., 2004; Putnam, Deshler, & Schumaker, 1993). Further, research on strategy instruction has demonstrated that unless students are provided with numerous opportunities to practice a strategy, they will not use the strategy correctly or independently (Scanlon et al., 1996). Thus, students need opportunities to use strategies consistently and to receive constructive feedback so that they can learn to monitor and evaluate the effectiveness of the strategies they apply to their work. Specifically, each student needs to understand when, why, and how a given strategy will be effective because it matches his or her learning style. For instance, when students are required to use a specific strategy such as a graphic organizer or a linear outline each time they write a paragraph, and they find that this visual aid helps them to organize their writing and succeed, they eventually will use this strategy independently and will generalize it to different settings. Conversely, if the strategy is not a good fit for a particular student's learning profile, he or she needs to have the self-understanding to recognize what does or does not work in order to develop as an effective and flexible learner. The goal of strategy instruction should be to help each student develop fluent and automatic use of strategies that work best for him or her.

- *Strategy instruction should address students' motivation and effort.* Motivation plays a critical role in strategic learning, as students

are more likely to use strategies if they are aware that these strategies will result in improved performance and higher grades. Students' motivation to use learning strategies is heavily dependent on their self-awareness and self-understanding (Deshler, Warner, Schumaker, & Alley, 1983; Deshler & Shumaker, 1986; Meltzer, 1996; Meltzer, Roditi, Houser, & Perlman, 1998; Paris & Winograd, 1990; Pressley et al., 1989). More specifically, students' awareness of their own strengths and weaknesses is an underlying component of effective strategic learning, as is their understanding of the impact that strategies can have on their performance (Meltzer, 1996; Meltzer, Katzir-Cohen, Miller, & Roditi, 2001; Meltzer, Katzir, et al., 2004). Furthermore, students' willingness to make the effort to use strategies is affected by their self-concept and self-confidence in the learning situation, particularly when they have experienced considerable frustration and failure in school as a result of learning and attention problems. Thus, as students become increasingly aware of the benefits of strategy use, they become independent learners and are more motivated to invest the effort to continue to use the strategies that work for them (Meltzer, Katzir, et al., 2004; Meltzer, Reddy, Pollica, & Roditi, 2004). Academic success results in positive academic self-concepts and shifts in self-perceptions so that students view themselves as capable learners with the potential to succeed in the classroom. *Drive to Thrive* is one model of an intervention program that is designed to train teachers to promote strategy use, focused effort, and positive academic self-concepts in their students (ResearchILD, 2005). This program is described in greater detail in a later section of this chapter.

CREATING STRATEGIC CLASSROOMS

Every grade level heralds changes in the curriculum, the setting, the expectations, and in each student's cognitive and social development. Students' learning profiles are not static but often change as a function of the match or mismatch between their specific strengths and weaknesses and the demands of the classroom, the teacher, and the curriculum (Meltzer, Roditi, Steinberg, et al., 2005). Critical transition times in the curriculum such as first grade, fourth grade, middle school, high school, and college can be particularly problematic for students. Each of these transitions corresponds with increased organizational demands and the introduction of tasks such as complex writing assignments, book reports, and multiple-choice tests that require the coordination and integration of multiple skills and strategies. Thus, learning metacognitive strategies in the context of the classroom curriculum becomes increasingly important and valuable, as these skills are crucial for all grade lev-

els (Meltzer, Roditi, Steinberg, et al., 2005). For example, a strategy used to enhance reading comprehension of a novel in the fifth grade can also be used when reading books and articles at the college level. While the content changes from year to year, the process, or *how*, of learning is consistent and can be modified to address the changes in the curriculum and the task requirements. When classroom-based strategy instruction is implemented, the content becomes a springboard for teaching students how to learn and is not an end in itself. These strategies, if taught systematically and consistently, can begin to address many of the most important executive function processes, such as planning, organizing, prioritizing, accessing working memory efficiently, shifting, and checking. More specifically, these strategies can be used to teach students:

- How to plan and organize new concepts and material
- How to memorize (e.g., vocabulary, science terms, history facts)
- How to shift flexibly in order to process and learn new information efficiently and easily (e.g., active reading strategies)
- How to check and edit for errors in spelling, writing, and math.

The following section focuses on strategies for addressing each of these executive function processes.

Planning and Setting Goals

Planning, or the organization of information and details ahead of time, is an important executive function process that is not taught systematically in schools even though it is a prerequisite for reading, writing, and completing projects in content areas such as science and social studies. Students are not usually taught to set short- and long-term goals that guide their approach to homework, studying, and test taking. Many students with executive function difficulties may begin tasks impulsively with no plan of action. This often results in their "getting stuck" when the next step is unclear and in an end product that is disorganized and incoherent. The critical executive function processes of planning and goal setting help students understand the objective of a particular task, visualize the steps of the task, organize time effectively, and determine the resources needed to complete the task. Planning and goal setting are integral parts of many successful self-regulated learning interventions. When students set their own goals, they show greater commitment and are more motivated to attain these goals (Schunk, 2001; Winnie, 1996, 2001; Zimmerman, 2000; Zimmerman & Schunk, 2001). Goal setting has also been found to enhance self-efficacy, achievement, and motivation (Schunk, 2001).

Students can be taught effective planning and goal-setting strategies from the early grades. Teachers can model the planning process by making daily schedules, using calendars, and setting agendas for class meetings. Younger students can be taught strategies for planning their homework, long-term projects, study time, and classroom activities. These strategies are even more important in the middle and high school grades, when students are required to plan their study time, long-term projects, and papers. At these levels, time management is critically important, as students are required to juggle multiple deadlines for many different ongoing assignments and projects. They often underestimate the amount of work involved in major projects and open-ended tasks and need strategies for breaking down tasks into manageable parts. Time-management strategies help students schedule their homework and study time after school when time is less structured. Use of weekly and monthly calendars for tracking deadlines for long-term projects and assignments as well as self-pacing to complete assignments helps impose structure and self-monitoring. These executive function processes are critical for promoting independent learning as part of the homework process (Hughes, Ruhl, Schumaker, & Deshler, 2002; Sah & Borland, 1989). Figure 8.2 provides an example of a time management strategy for homework completion.

Organizing and Prioritizing

Organization, or the ability to systematize and sort information, is an executive function process that underlies most academic and life tasks. Strategy instruction needs to focus on teaching students systematic approaches for organizing their materials, information, and ideas and applying these strategies to their writing, note taking, studying, and test preparation. Each of these areas is discussed below (Meltzer, Roditi, Steinberg, et al., 2005).

Homework Time Sheet

Assignment	Estimated Time	Actual Time
Social studies reading and note taking	30 min.	1 hour
Math problems	20 min.	25 min.
Spanish worksheet	20 min.	15 min.

FIGURE 8.2. Homework planning sheet.

Organization of Materials

Explicit systems and strategies are important for teaching organization of materials, such as color-coding strategies for teaching students how to organize their notebooks, binders, and assignment books. It is critical to teach students to allot a specific time period each week to organize their materials and folders in a systematic way.

Organization of Ideas and Information

At the middle and high school levels, students are presented with an enormous volume of detailed information in their curricula. How well they learn and remember this information depends on how effectively they use strategies for organizing and prioritizing concepts and details so that working memory is less cluttered (Hughes, 1996). While many students are able to participate in class lessons and to complete structured homework assignments accurately, they have more difficulty with independent, open-ended tasks. Reading and note-taking tasks, studying for tests, and completing writing assignments all require students to impose their own structure on the information. When strategies are taught that structure these open-ended tasks, students are more likely to achieve higher grades. Success results in increased motivation to use these strategies independently and to generalize across different contexts (Meltzer, 1996; Swanson, 1999b). Strategies for organizing and prioritizing information are critically important for writing, note taking, studying, and test preparation, all of which are discussed below in greater detail.

Organizational Strategies for Writing

From late elementary school on, the writing process can often be overwhelming for students who are required to complete lengthy writing assignments and essay tests that rely heavily on executive function processes. Writing requires the coordination and integration of many different cognitive processes and skills, including memory, planning, generating text, and editing (Flower et al., 1990; Flower, Wallace, Norris, & Burnett, 1994). While writing, students need to monitor multiple goals (Hayes, 1996) and to satisfy many constraints, such as those of topic and purpose. Therefore, students also need to switch flexibly among various writing processes, such as critical thinking (e.g., perspective, logic), rhetorical devices (e.g., description, persuasion), and writing conventions (e.g., tone, mechanics, spelling) (Bruning & Horn, 2000). Thus, writing requires the coordination and integration of a broad range of executive function processes. Students benefit from strategies that address these processes, such as planning, monitoring, evaluating, and revising their work (Bruning &

Horn, 2000; Kellogg, 1987; Ransdell & Levy, 1996; Scardamalia & Bereiter, 1986; Zimmerman & Risemberg, 1997).

Many students have particular difficulty when they are required to organize their ideas for writing and need the writing process to be broken down explicitly with organizers and templates that match both the goals of the assignment and the student's learning style. Writing templates and graphic organizers need to be well-structured so that students can easily translate their ideas into paragraph form. Such templates and organizers are helpful for many different genres of writing, including book reports, persuasive essays, descriptive paragraphs, news articles, summaries, reflections, and narratives (Schunk & Swartz, 1993).

Graphic organizers used in middle school for helping students plan and prioritize their ideas for essay writing can be extrapolated to more complex reports and papers at the high school and college levels (see Figure 8.3).

With consistency and feedback, teachers can help students internalize these strategies and organize their writing independently by prioritizing and breaking writing tasks into manageable parts. This allows students to monitor their progress and to experience success during the writing process (Bruning & Horn, 2000). In fact, research has shown that teacher guidance and feedback have a significant impact on students' willingness to use these strategies and also increase their self-confidence and writing performance (Pajares & Johnson, 1996; Skinner, Wellborn, & Connell, 1990). Further, when strategies that address executive function are successfully incorporated into the teaching of writing, they increase the likelihood of strategy use in the future (Graham & Harris, 2000, 2003; Harris & Graham, 1996; Scardamalia & Bereiter, 1985; Zimmerman & Risemberg, 1997). Rubrics such as the one in Figure 8.4, from the *Drive to Thrive* program (Meltzer, Steinberg, Button, et al., 2005) provide a structured approach that teachers can use for teaching and evaluating students' use of executive function processes when they write.

Organizational Strategies for Note Taking

The way my mind works with that liquefied gobble of dots, my notes would look scattered on a page. One of the most useful strategies I learned was multicolumn notes. With this system, I learned to make a hierarchy of notes and have it structure around itself and relate to things. This structure helped me to study and to write long papers.

—BRANDON, COLLEGE GRADUATE

Note taking from reading and lecture material is a common assignment given to students like Brandon, especially at the high school and college

	Brainstorm	Organize	Topic Sentence	Evidence	Conclusion
	Essay Question: <u>All About Emily</u>				
X	BRAINSTORM your ideas here. 1. <u>My Family</u> 2. <u>hobbies</u> 3. <u>doodling</u> 4. <u>Sports</u> 5. <u>School</u> 6. <u>friends</u>				
X	ORGANIZE: Choose at least 3 ideas from your brainstorm list above that relate best to the essay question: 1. <u>friends</u> 2. <u>Family</u> 3. <u>hobbies</u> 4. _____				
✓	TOPIC SENTENCE: Create a topic sentence that introduces your entire essay. <u>This essay is about a girl named Emily.</u>				
	EVIDENCE: List each of your chosen ideas above and add at least <u>one</u> example for each idea: Idea #1: <u>Emily's friends</u> Example: <u>Rebecca and Talia</u> Example: <u>Sarah and Lily</u> Idea #2: <u>Emily's hobbies</u> Example: <u>Soccer and knitting</u> Example: <u>reading</u> Idea #3: <u>Emily's family</u> Example: <u>Mom and dad</u> Example: <u>Reid and Lee</u> Idea #4: _____ Example: _____ Example: _____				

Details

- examples
- facts
- ideas
- names
- dates
- places

EssayExpress Revised Draft Teacher's Guide page 35

FIGURE 8.3. A student's use of the BOTEC template (from Essay Express; Research Institute for Learning and Development & FableVision, 2005) to plan and organize her essay.

Objectives	Below Average	Needs Improvement	Proficient	Exemplary Performance	Earned Points
Planning	1 point Little or no evidence of planning.	2 points A planning sheet is included but it is incomplete.	3 points Student includes an outline or graphic organizer that is partially filled out. Planner is somewhat related to final essay.	4 points Student includes completely filled out outline or graphic organizer and final essay reflects its use.	
Organizing	1 point Student does not include a rough draft.	2 points Student includes a partially completed rough draft that does not follow an organizational plan.	3 points Student includes a rough draft that roughly follows his or her outline or graphic organizer.	4 points Student includes a rough draft that is well organized and follows the planning tool.	
Shifting	1 point Student shows no changes from the rough draft to the final draft.	2 points Only slight evidence of improvements is seen between the rough and final drafts.	3 points Student makes at least two changes beyond spelling and punctuation in the final draft.	4 points The student takes a different point of view in the final draft or makes at least three major improvements between the rough draft and the final draft.	
Prioritizing	1 point Essay includes no transition words to show sequence, contrast, or relative importance of ideas.	2 points Essay includes only transition words such as "and," "also," and "but."	3 points Essay includes two more sophisticated transition words that indicate sequence, importance, or contrast, such as "however," "on the other hand," "another example," etc.	4 points Essay includes more than two transition words to connect ideas or paragraphs.	
Checking	1 point Student does not submit a checklist with the writing project.	2 points Student checks for a few mistakes but not for others.	3 points Student checks off the checklist to indicate that he or she checked most of the items on the list.	4 points Student submits checklist indicating that he or she has checked for each item on the list. Student's writing reflects no errors that are listed on the checklist.	
	0 points	0 points	0 points	0 points	
					Score:

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FIGURE 8.4. Writing rubric from the *Drive to Thrive* program.

levels (Putnam et al., 1993). Independent note taking has been found to increase class participation and improve the recall of material (Ruhl & Suritsky, 1995), and many teachers assume that students know how to take notes that will be used for homework, studying, or other assignments. The note-taking process is complex, however, and requires the coordination and integration of multiple processes including listening, differentiating main ideas from details, and writing (Kiewra et al., 1991). As a result, many students have difficulties transcribing their notes, as well as discerning which information should be recorded (Hughes, 1991; Hughes & Suritsky, 1994; Suritsky, 1992). In fact, many students read their textbooks and articles without taking notes or take notes using a format that is not very helpful to them. Teaching and requiring organizational strategies for note taking ensures that students are interacting with text as they read instead of reviewing the information passively (Deshler et al., 1996; Hughes & Suritsky, 1994). Further, by providing note-taking templates and teaching students how to use these, teachers create a structure for students to organize information and to differentiate major themes from details, which results in improved performance (Boyle, 1996, 2001; Boyle & Weishaar, 1999; Katamaya & Robinson, 2000; Lazarus, 1991).

These templates, thinking maps, and graphic organizers can be particularly effective for helping students bypass their difficulties when they are required to recall and organize verbal information (Kim, Vaughn, Wanzeki, & Shangjin, 2004). In fact, findings have shown that graphic organizers provide frames that help students learn material in a clear, logical format and relate new information to known information (Ausubel, 1963; Mayer, 1984). Graphic organizers are also effective for improving student performance across a wide range of subject areas, including reading, science, social studies, language arts, and math (Bos & Anders, 1992; Bulgren, Schumaker, & Deshler, 1988; Darch, Carnine, & Kame'enui, 1986; Herl, O'Neil, Chung, & Schacter, 1999; Ritchie & Vokl, 2000), and across multiple grade levels from elementary school through high school (Alverman & Boothby, 1986; Horton, Lovitt, & Bergerud, 1990; Ritchie & Vokl, 2000; Scanlon, Duran, Reyes, & Gallego, 1992; Willerman & Mac Harg, 1991). Templates such as the one shown in Figure 8.5 help students take notes more efficiently and access the most important information.

Similarly, taking two-column notes instead of using a traditional note-taking format helps students to ask themselves active questions about the text they are reading. This format encourages them to find the main ideas, "chunk" information into manageable parts, and predict test questions (see Figure 8.6).

Math Notes		
Topic <u>Adding and subtracting fractions</u>	Date <u>11/16/06</u>	
Chapter <u>H</u>	Lesson <u>4.10</u>	Page # <u>241-243</u>
Vocabulary		
Term	Definition	Example
Least common denominator (LCD)	The least common multiple of the denominators of 2 or more fractions	$\frac{1}{8}$ and $\frac{3}{4}$, LCD = 8
Key information		
1. If the denominators are the same, add or subtract the numerators. 2. If the denominators are different, find the LCD & change numerators. 3. Add or subtract the numerators. 4. Reduce if possible or change to a mixed number.		
Examples		
$\begin{array}{r} \text{LCD} = 15 \\ \frac{4}{5} \times \frac{3}{3} = \frac{12}{15} \\ + \frac{1}{3} \times \frac{5}{5} = \frac{5}{15} \\ \hline \frac{17}{15} = 1\frac{2}{15} \end{array}$	$\begin{array}{r} \text{LCD} = 16 \\ \frac{7}{8} \times \frac{2}{2} = \frac{14}{16} \\ - \frac{1}{16} \times \frac{1}{1} = \frac{1}{16} \\ \hline \frac{13}{16} \end{array}$	

FIGURE 8.5. Note-taking template for math.

Ch 14, Sec. 1	
<u>Italian Beginnings</u>	
When was the Ren. in Italy?	mid 1500s 1500s
Why was Italy the birthplace of the Renaissance?	reawakened interest in ancient Rome Italy center of Roman hist. - artifacts there to remind of anc. Rome

FIGURE 8.6. Example of a student's use of the two-column note-taking template.

Organizational Strategies for Studying and Test Preparation

Test results are the gateway to school success, graduation, college entry, and job advancement. Study and test-taking strategies are critically important in view of the demanding curriculum standards and the pressure on all students to perform optimally in test situations. Many students, especially those with learning and attention problems, often lack "test-wiseness," or facility with test-taking strategies, and their grades on tests do not reflect their understanding, the extent of their preparation, or their level of ability (Meltzer, Roditi, & Stein, 2002; Meltzer, Roditi, Steinberg, et al., 2005). They need systematic instruction in study strategies that help them organize their materials when they study and complete homework, prioritize and figure out what is most important to study, shift flexibly among different strategies, analyze questions on tests and work assignments, and check their answers in their written work. When strategies are taught systematically in each of these cognitive areas, students improve their efficiency and accuracy before, during, and after tests (see Figure 8.7). One

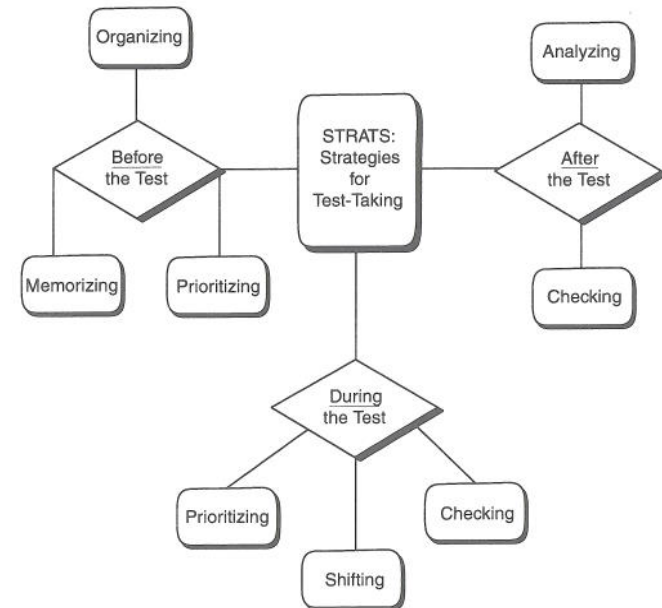


FIGURE 8.7. STRATS paradigm of addressing test-taking strategies before, during, and after a test.

example of an easy-to-use, systematic approach for teaching students strategies that address these executive function processes is represented in BrainCogs (Research Institute for Learning and Development & FableVision, 2002). BrainCogs is a computer program that is designed to help students develop strategies for learning, studying, and successful test taking and apply strategies that match their learning profiles. Approaches like this are important for helping students learn *how* to organize, prioritize, integrate, and retrieve information while simultaneously learning the required content. Students also learn *when* to use *which* strategies in *which* contexts.

The BrainCogs Triple Note Tote strategy (Figure 8.8) helps students organize and memorize information simultaneously. As is evident from Figure 8.8, the student writes the vocabulary term in the first column, the definition in the second column, and a memory strategy in the third.

TRIPLE NOTE TOTE		
QUESTION/TERM	ANSWER/DEFINITION	STRATEGY
What are the steps of photosynthesis?	<ol style="list-style-type: none"> 1. <u>Water</u> and nutrients are transported from the roots, up the stem to the leaves. 2. <u>Light</u> energy from the sun is trapped by chlorophyll. 3. Energy trapped by the chlorophyll turns CO₂ from air to <u>sugars</u> and releases O₂. 4. <u>Sugars</u> are transported down the stem to be stored. 	<p>We</p> <p>Love</p> <p>Sugary</p> <p>Treats</p>
		<ol style="list-style-type: none"> 1. <u>Water</u> 2. <u>Light</u> 3. <u>Sugars</u> 4. <u>Transport</u>

FIGURE 8.8. A student's use of the Triple Note Tote template (BrainCogs; Research Institute for Learning and Development & FableVision, 2002) to organize information.

Shifting Flexibly

Cognitive flexibility, or the ability to shift mindsets, is often extremely challenging for students, especially those with learning and attention difficulties (Meltzer, 1993; Meltzer, Soloman, Fenton, & Levine, 1989). Shifting requires students to interpret information in more than one way, change their approach when needed, and choose a new strategy when the first one is not working (Westman & Kamoo, 1990). Bereiter and Scardamalia (1985) have argued that instruction must include opportunities for students to use their acquired knowledge flexibly. Similarly, Bransford, Vye, and Adams (1989) have emphasized the importance of providing students with opportunities to solve problems from a variety of perspectives to teach cognitive flexibility.

In the classroom setting, cognitive flexibility is essential for effective reading, writing, math problem solving, and test taking. To read novels with complex or figurative language, students must shift between the concrete and the abstract, between the literal and the symbolic, and between major themes and extraneous details. Similarly, when writing, students must shift between their own perspective and that of the reader and between the main ideas and supporting details. When taking tests, students are required to shift among multiple topics or problem types and are often faced with information that is presented differently from the way in which they learned or studied it. Similarly, when students read words or phrases that have multiple meanings, they have to shift their mindsets or perspectives. Students can practice identifying multiple meanings in newspaper headlines, jokes, and riddles. Students can also be provided with sets of questions at their desks, in their binders or folders, on bookmarks, or posted in the classroom to help them shift more efficiently. When students come across words or sentences that do not make sense to them, they can stop reading and ask themselves the following questions:

- Does the word have more than one meaning?
- Can the word be used as both a noun and a verb?
- Can I emphasize a different syllable of the word to give it a different meaning?
- Can I emphasize different parts of the sentence to change its meaning?
- Does the passage contain any figurative language, such as metaphors or expressions that may be confusing?

Similar shifting strategies can be applied to writing. Students can be required to shift roles when they edit their writing (e.g., pretending they

are space aliens or the teacher and switching pens while editing their writing). By playing different roles, students are more likely to find mistakes and identify areas that need improvement. This helps them shift perspectives to check whether they have explained information clearly and have supported their arguments with enough details.

In the area of math, shifting is essential for working efficiently and accurately. Students often get stuck trying to solve a problem in one way when there may be an easier or more efficient way to find a solution. Similarly, students may have seen problems presented in a particular format while in class or completing homework but may have trouble recognizing similar problems when these are presented differently on tests. Furthermore, while students can often solve problems of the same type that are grouped together for homework practice, they often have difficulty shifting among multiple problem types in a test situation. Cognitive flexibility can be enhanced when students use strategies like asking themselves the following questions while completing math homework or while taking math tests:

- Do I know more than one way to solve the problem?
- Does this look similar to anything I have seen before?
- Is this problem the same or different from the problem before it?

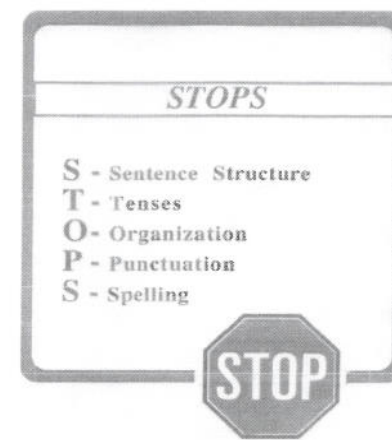
Teachers can also help students recognize that specific problems require them to shift from one operation (e.g., addition) to another (e.g., subtraction). Teachers can also help students solve certain types of math problems, and recognize and differentiate different problem types from one another.

Self-Monitoring and Self-Checking

Self-checking, or the ability to reflect on one's performance and identify errors, is an executive function process that is often extremely challenging for students. While students are often told to check their work, many students do not know *how* to check or *what* to check for. The most effective checking involves learning what types of errors to check for, how to check for these errors, and how to self-correct. Self-monitoring strategies are effective for improving the performance of students with learning disabilities (Harris, 1986; Reid, 1996; Reid & Harris, 1993; Shimabukuro, Prater, Jenkins, & Edelen-Smith, 1999; Webber, Scheuermann, McCall, & Coleman, 1993). Students need to know exactly what is expected from them on an assignment and how to check for their most common mistakes in order to be successful (Maccini & Hughes, 1997; Mastropieri & Scruggs, 1995).

Students often have difficulty with open-ended projects or assignments that involve multiple components. They may complete these quickly without checking for the details that teachers expect. Providing explicit checklists for particular assignments means students will know what to check for and make fewer errors. While general checklists work for many students, personalized checklists help students become aware of and search for *their own* most common errors (Dunlap & Dunlap, 1989). While one student may consistently make spelling errors but have no difficulty with organization, another may have the opposite profile. Students can make personalized checklists that include their most common mistakes and can develop their own acronyms to help them remember the details that need to be corrected. For example, the acronym STOPS (see Figure 8.9) was developed by a sixth-grader to help check his writing for errors he commonly made.

Students should be encouraged to make checklists for all content areas and to post these in the appropriate places such as folders, binders, bulletin boards, or even on the refrigerator. In addition to studying content, students should be encouraged to study their checklists. Personalized checklists are useful for all students, whether they complete their homework inaccurately, make careless errors on tests, or struggle with the mechanics of writing. Figure 8.10 is an example of a student-made personalized checklist.



Developed by Colin Meltzer, 1995

FIGURE 8.9. Personalized acronym for self-checking.

MATH CHECKLIST
• READ DIRECTIONS CAREFULLY
• REDUCE FRACTIONS
• LABEL ANSWERS
• Ask "DOES MY ANSWER MAKE SENSE?"

FIGURE 8.10. Personalized math checklist.

Creating a Culture of Strategy Use in the Classroom

While strategy instruction is critical for students with learning and attention problems, it is beneficial for all students in order to enhance their use of executive function processes (Meltzer, Katzir, et al., 2004). While some students automatically use strategies without being taught them explicitly, most students need systematic strategy instruction. The classroom teacher plays a critical role in teaching students executive function strategies that they can use throughout their lives. Research has shown that strategy instruction works best when it is consistent and embedded in the curriculum (Deshler et al., 2001; Hattie et al., 1996). Teachers can create "strategic classrooms" by making strategy use a core component of the classroom culture. The following are ways that a strategic classroom culture can be fostered.

- Explicit instruction and modeling can make strategies a part of the language of the classroom.
- Students can develop their own personalized strategy notebooks where they collect the strategies that work best for them.
- Students can participate in "strategy share" discussions, where they teach other students the personalized strategies that they have created.
- Strategies can be collected throughout the year and made into a "strategy book" for the classroom that can be used by other students.
- Teachers can make strategy use a required part of their curriculum by grading students based on the processes and strategies they have used to reach their goals, in addition to the end product. Each test or assignment can include a strategy reflection component at the end, where students record the strategies they have used to complete assignments or to study for tests (see Figure 8.11).
- To motivate students to use strategies, teachers can help students keep track of their progress and strategy use through charts or

<i>Strategy Reflection for Studying</i>	
<i>Check off the strategies you used to study for this test.</i>	
<input type="checkbox"/> Flash cards/Strategy cards	<input type="checkbox"/> Two-column notes
<input type="checkbox"/> Triple Note Tote (@BrainCogs)	<input type="checkbox"/> Mapping/webbing
<input type="checkbox"/> Acronyms	<input type="checkbox"/> Discussing with a parent/friend
<input type="checkbox"/> Crazy Phrases (@BrainCogs)	<input type="checkbox"/> Other _____
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FIGURE 8.11. Strategy reflection card. Copyright 2004 by ResearchILD. Reprinted by permission.

graphs of their performance on homework, tests, projects, and writing assignments.

- To encourage strategy use, teachers can help their students access previous memories of success through leading questions, such as:
 - Do you remember another time you had trouble with a similar task? What did you do?
 - Have you learned a strategy to help you solve this problem?
 - Do you remember how easy the last vocabulary test was when you used a particular strategy? Why not try that again?
 - Do you remember the last time you made an outline before writing your essay? Wasn't it much easier to write when your ideas were organized?

The *Drive to Thrive* program, summarized below, is one example of a model program designed to integrate strategy instruction into the school curriculum to teach students the core executive function processes.

The Drive to Thrive Program

Studies of student motivation, effort, and strategy use indicate that students who understand the importance of applying strategies to their schoolwork begin to recognize that their academic struggles are not insurmountable and that they can achieve greater success when they use learning strategies (Meltzer, Reddy, Pollica, & Roditi, 2004, 2005b). Results from a 6-month, strategy-based classroom instruction intervention showed significant improvements for at-risk students with learning and attention problems (Meltzer et al., 2001; Meltzer, Katzir, et al.,

2004). Specifically, teachers reported that their students made academic gains, were academically more strategic, and invested more effort in their schoolwork. These at-risk students were more self-confident and viewed themselves as more successful in their academic performance on reading, writing, and spelling tasks. Most important, all students, including those with no immediate academic problems, benefited from learning a broad array of strategies to improve their performance on classwork and tests (Meltzer et al., 2001; Meltzer, Katzir, et al., 2004; Meltzer, Katzir-Cohen, & Roditi, 2000). These results indicated that successful strategy use mediates the relationship between students' self-reported levels of effort and their academic self-concepts (Meltzer, Katzir, et al., 2004; Meltzer, Reddy, Pollica, & Roditi, 2004). The *Drive to Thrive* program builds on these findings by emphasizing that teaching students how to implement strategies successfully can initiate a positive cycle in which students focus their effort and use strategies effectively, resulting in more efficient performance and improved academic performance. This, in turn, results in positive academic self-concept so that students are more willing to work hard and to use strategies again (see Figure 5.3 in Chapter 5).

The *Drive to Thrive* intervention program has been designed to address these interactions among effort, strategy use, academic self-concept, and classroom performance by teaching students strategies that strengthen the executive function processes. Teachers are trained to infuse strategy instruction that addresses executive function processes into the standards-based curriculum in their inclusive classrooms and to evaluate their students on the basis of their strategy use as well as their content knowledge (Meltzer, Roditi, Button, Pollica, Steinberg, Stein, et al., 2005b). The overall goal of the *Drive to Thrive* program is to create a school culture where general and special education teachers have a shared understanding of the importance of nurturing efficient strategy use, executive function processes, focused effort, and positive academic self-perceptions in their students.

CONCLUSIONS

As the demands of our school curricula increase, students are expected to use executive processes for more and more assignments in order to prepare for high school, college, and beyond. The primary goal for teachers has been to prepare students by teaching them the content and skills valued by our highly literate society, such as reading, writing, spelling, math, history, and science. While the end product of learning is important, it is evident that students do not retain all the content they

are taught from year to year. Therefore, it is even more important to teach students the executive function processes that *will* carry over from elementary school to middle school, high school, college, and even into the real world.

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