Interventions That Positively Impact the Performance of Students with Learning Disabilities in Secondary General Education Classes

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Most adolescents with learning disabilities spend the majority of their school day in general education classes and are expected to meet most, if not all, of the academic requirements of these classes. This review of the literature describes interventions shown to positively impact academic performance of students with learning disabilities in middle and high school general education classes. These interventions are organized into one of three categories: student-focused, teacher-focused, and peer-focused.

Over the past decade, increasing numbers of students identified as having a learning disability are spending the majority of their school day in general education classrooms. This trend holds true across the grade-span and includes students with learning disabilities in middle and high schools. While many professionals applaud this trend for a number of reasons, concerns related to the academic success of adolescents with learning disabilities in secondary content classes also are evident (Schumaker & Deshler, 1988). Indeed, several current indicators (e.g., grades, dropout/graduation rates, attendance in postsecondary programs) show many students struggling at this level and beyond (Gersten, 1998; Vaughn & Schumm, 1995). Additionally, serious concerns have been expressed about whether students with disabilities have *meaningful access* to the general education curriculum (Fisher, Schumaker, & Deshler, 1996; Gersten, 1998).

There are a number of reasons why many adolescents with learning disabilities have difficulty mastering secondary level curriculum. First, are the well documented learning characteristics of this group of students, including dysfluency in basic academic skills, lack of organizational skills, and ineffective and inefficient learning and problem-solving strategies needed for independent learning (Deshler, Ellis, & Lenz, 1996). Interacting with these academic problems are institutional characteristics particular to secondary schools including what is taught (e.g., content versus skills) and how it is taught (e.g., increased didactic presentation via lecture). For example, increasing amounts and complexity of information are presented in lecture and text, and expectations are that all students, including those with learning disabilities, will meet academic standards. Too, there is an increasing call for all learners to not only acquire information but to apply it as well (Bulgren & Lenz, 1996; Mastropieri & Scruggs, 2001). Finally, students in middle and high school attend more classes, with more students, and do so with less individualized teacher attention.

Given the daunting task of providing meaningful access to the general education curriculum for adolescents with learning disabilities, it seems imperative that general and special secondary teachers are aware of empirically validated or supported practices that promote academic success in middle and high schools. To that end, in this article we identify and describe instructional procedures shown to have a positive impact on the academic performance of adolescents with learning disabilities in general education content classes. It is beyond the scope of this paper to provide information sufficient for implementation, therefore the primary purpose is to provide the reader with a description of the types of interventions with research support and the instructional variables that appear to lead to positive student outcomes. We have provided a research and resource bibliography for each category of intervention so readers have access to additional information that will assist with putting research into practice.

Methods for Identifying Studies

To be considered for inclusion in this review, studies must have met the following criteria: (a) targeted adolescents with learning disabilities (grades 6-12) currently enrolled in general education classes, and (b) measured an interventions' impact on an academic or academically related task required in one or more general education classrooms. It is important to stress that primary instruction on the intervention may have been provided by someone other than the general education teacher (i.e., special education teacher or researcher) or may have occurred outside the general education classroom (e.g., resource room). What was critical was that the researchers investigated the impact of the intervention on a task (e.g., test performance, homework/assignment completion) required in the general education classroom.

Search procedures consisted of three steps. First, electronic searches of the Library Information Access System (LIAS), the ERIC Database, and PsychINFO systems were conducted for articles meeting the above inclusion criteria and published between 1970 and 2002. Next, an ancestral search was conducted of articles identified via the electronic search. Finally, a hand search of four journals specific to learning disabilities and four journals related to special education in general was conducted for the same time period noted above. Ultimately, 35 articles meeting the above cri-

teria were located. Not all of these studies are described in this article but rather a few considered representatives have been chosen as examples of the type of research that has been conducted on this topic. We have chosen this format to make the information more *consumer friendly*.

Emphasis and Organization of Results

Because the purpose of this article is to provide information about research-supported practices, we will not describe and critically analyze each article within the text. However, an extensive list of the studies upon which this article is based is presented in Appendix A. While we provide cautions and qualifications based on our critical analysis of the entire body of research, our emphasis will be on describing the intervention and summarizing implementation issues rather than providing an analysis of each study.

We used three categories to provide a framework for organizing the identified interventions. These categories are (a) student-focused, (b) teacher-focused, and (c) peer-focused. Additionally, there were a number of studies meeting the search criteria that used computer-based instruction as the primary intervention. These studies are reviewed in a separate article by Maccini, Gagnon, & Hughes, (2003).

Interventions

Student-Focused Interventions

Student-focused interventions are those in which students are taught skills or strategies that help them manage their academic or academically related behaviors. Once learned, the student takes major responsibility for using the strategies appropriately. Two broad areas of intervention are included in this category: Learning Strategy Instruction and Behavioral Self-Management Techniques.

Learning strategies instruction. A learning strategy, as typically taught in schools and reported in the professional literature, is student application of factual, procedural, and conditional knowledge while solving a problem. While many students develop an extensive repertoire of learning strategies on their own (through trial and error or by incidental learning), a significant group of students do not. Indeed, many adolescents with learning disabilities who are struggling in middle and high school have not independently developed systematic and organized ways to learn. That is, they do not develop effective and efficient strategies for solving problems and completing tasks. These students need to be directly taught strategies in order to become more independent, self-regulated learners.

During learning strategy instruction, students are typically taught to apply a series of steps required to solve a problem or complete a task. One of the most frequently used and researched learning strategy curriculum is part of the Strategic Instructional Model (SIM) developed through the University of Kansas Center for Research on Learning (CRL) (Deshler et al., 1996). Some of the SIM strategies have an empirical research-base that included measuring their impact on performance in general education settings. Thus, the SIM will be used here as the basis for describing learning strategy instruction.

The SIM focuses on teaching adolescents with learning problems to use specific strategies designed to help them deal with the academic demands placed on them in general education classes. Strategies within the SIM curriculum include those designed to help students acquire (e.g., reading comprehension strategies), store (e.g., memory strategies) information/content, express (e.g., written expression strategies), and demonstrate (e.g., assignment completion and test-taking strategies) what they know.

Figure 1.

Components of the assignment completion strategy.

P sych up
   1 Cues the learner to self-instruct to be ready. (A self-instruction strategy.)
R ecord and ask
   2 Cues the learner to write the assignment, reflect, and ask questions. (A questioning strategy.)
O rganize
   3 Cues the learner to make a plan. (A planning strategy.)
J ump to it
   4 Cues the learner to take control and set goals. (A self-control strategy.)
E ngage in the work
   5 Cues the learner to complete the work and ask questions. (A self-questioning strategy.)
C heck the work
   6 Cues the learner to check and correct the work. (A self-monitoring strategy.)
T urn it in
   7 Cues the learner to get the work turned in on time. (A monitoring strategy.)

From Hughes, C. A., Ruhl, K. L., Deshler, D. D., & Schumaker, J. B. (2002). Effects of teaching an assignment completion strategy to adolescents with learning disabilities. *Learning Disabilities Research and Practice, 17*(1), 1-18.

To help illustrate this particular approach to strategies instruction, the *anatomy* of one of the strategies that was shown to positively impact the homework performance of middle school students with learning disabilities in their

general education classes is shown in Figure 1. This strategy, like all strategies within the SIM, consists of a series of steps that form a first-letter mnemonic, in this case PROJECT (Hughes, Ruhl, Deshler, & Schumaker, 1995; Hughes, Ruhl, Deshler, & Schumaker, 2002). This mnemonic device helps students remember the strategy steps. Each step is designed to cue a behavior or set of behaviors. For example, the *Prepare* step prompts students to prepare or look over their homework assignment books and make sure their monthly and weekly calendars are up-to-date. The second step, *Record and Ask*, cues students to accurately enter their homework assignment on a pre-prepared assignment sheet and to do so quickly using abbreviations. The third step, *Organize*, is a prompt for students to break their assignment into parts (e.g., in order to write a research paper students need to identify sources, read sources, outline, write a first draft, edit, and make a final draft), estimate how long it will take to complete the assignment, and schedule when they will work on it. Also, as can be seen in Figure 1, steps in a learning strategy typically involve higher-order procedures such as planning, self-instruction, self-questioning, self-monitoring, and self-evaluation.

A key component of strategy instruction is not only what is contained in the strategy but also how it is taught. Most research on instructional methodology with students with learning disabilities supports the need for a structured, systematic, and intensive approach that includes scaffolding procedures that incrementally move students toward independent strategy use. Thus, the SIM instructional stages used to teach a strategy follow a predetermined sequence. First, pre-testing is performed to assess current strategy use as well as whether the student has difficulties in the academic area for which the strategy is designed (e.g., reading comprehension, studying, test-taking, writing). Next, the teacher discusses the rationale for learning the strategy, clearly describes the strategy steps, and provides a detailed and systematic demonstration of how the strategy is applied.

Following the model instructional stage, students are taught why each strategy step is useful. For example, in the PROJECT strategy, students are taught that the reason for breaking their assignment into parts is because it will help them when estimating the amount of time and effort needed to complete the whole assignment. Then they engage in activities whereby they verbally rehearse by saying the steps of the strategy in sequence.

Once students memorize the strategy steps and demonstrate their understanding of why the steps are useful, they begin to practice the strategy in situations where the difficulty of the task is controlled. For example, if students are learning a reading comprehension strategy, they will practice it using reading material that is not too difficult. Once they have mastered the strategy in *controlled* materials or situations they begin to practice it in harder materials (e.g., materials used in their general education classes). Finally, a variety of generalization activities are conducted so that students can identify where, when, and why the strategy can be used and are prompted to begin to use the strategy in settings other than where instruction occurred.

Based on current research (Deshler, et al., 1996), we know that strategies can be learned by adolescents with learning disabilities and can have a positive impact on their performance in general education settings. We also know that to this point these types of strategies are typically taught in pull-out settings. Little is known about whether strategies can be taught (or co-taught) in content classes. There is a clear logistical rationale for this type of strategy instruction taking place in a learning support or resource class given the extensive time commitment it takes to teach students with learning disabilities to effectively generalize strategy use. On the other hand, there is some rationale for teaching strategies in the general education setting.

Some professionals have discussed possible advantages for teaching a strategy in the general education setting, stressing that students might do better when learning a strategy in the context of their content area assignments (Mastropieri, & Scruggs, 2001; Scanlon, Deshler, & Schumaker, 1996). Also, concerns about student generalization of strategy use when taught in a resource setting may be alleviated by teaching strategies in the general education classroom. Thus, the next direction for strategy research may not focus so much on whether strategies are useful, whether they can be learned, or how they are taught, but rather where they are taught. This area of research may include what structures or instructional arrangements are needed for effective co-teaching or peer-mediated approaches.

Self-management procedures. Behavioral self-management includes several procedures: (a) self-monitoring whereby students observe and record the occurrence of their behavior, (b) self-evaluation which requires students to make a judgment about the quality of their performance based on a predetermined criterion (i.e., goal setting), and (c) self-reinforcement, which includes self-selection and administration of a contingent reward (Hughes, Ruhl, & Misra, 1989).

These procedures may provide motivation for students because they promote active participation in the behavior change process that is reportedly important to adolescents. Self-management has also been purported to help generalize and maintain changes in behavior as well as ultimately free-up teacher time.

In most studies included in this review, a combination of techniques, or *self-management packages*, was used. To illustrate, Figure 2 contains the steps of the self-management strategy, POWER (Hughes & Ruhl, 2002; Sander, Bott, Hughes, & Ruhl, 1991), that helped students to improve the classroom behaviors of adolescents with learning disabilities. The first step in POWER requires students to self-select

a behavior for change, establish a goal related to the behavior as well as select a reward to self-administer when the goal is met. In the next two steps, students self-monitor (observe the behavior and record its occurrence or nonoccurrence). Then, at pre-designated times (e.g., at the end of the week), students evaluate their performance (decide whether a short or long term goal was met) and contingently reward themselves.

Figure 2.

A self-management package.

P lan to change my behavior (self-assessment)
- select and define my behavior
- establish my goal
- list my reward
- fix my recording forms

O bserve my behavior (self-monitoring)
W rite it down (self-monitoring)
E valuate my performance (self-evaluation)
R eward myself (self-reinforcement)

From Hughes, C. A., & Ruhl, K. L. (1990). The POWER self-management strategy. Unpublished manuscript.
Sander, N. W., Bott, D. A., Hughes, C. A., & Ruhl, K. L. (1991). Effects of a self-management strategy on task-independent behaviors of adolescents with learning disabilities. B. C. *Journal of Special Education, 15,* 65-75.

Analysis of self-management studies shows that students generally were taught how to self-manage using direct and explicit instructional methodology. For example, the behavior(s) of interest are clearly described and defined and the teacher often demonstrates examples and non-examples of the behavior so that the student understands the nature and scope of the behavior (e.g., what it is and what it is not). Often, some role-playing occurs so the student can practice the behavior under close teacher supervision. During this time of initial instruction, the student and teacher often discuss the importance of changing the behavior and situations where it is important to do so.

Because most self-management procedures involve forms to record occurrence of the behavior, and/or evaluate how well it is being performed, students need instruction in their use. Typically, teachers model what to record, how to record, and when to record as well as how to self-evaluate. Next, they provide guided practice until the student has demonstrated highly accurate use of the procedures.

Because the ultimate goal of self-management is to *internalize* the processes involved, teachers often institute fading procedures so that students gradually move away

from using recording forms or prompts (e.g., auditory signals) that signal the student to record/evaluate. Fading is done systematically whereby forms and cues are gradually eliminated and replaced with an occasional verbal prompt from the teacher.

To date, self-management procedures have been shown to be effective for improving academically related behaviors such as assignment completion, on-task behavior, and other school survival skills prerequisite for success. However, not much is known about its direct impact on learning (e.g., test scores, grades). Too, as with strategy instruction, much of the instruction on how to use self-management procedures has occurred in settings other than the general education class. Again, this is most likely due to the amount of time and effort needed to teach the skills included in these *packages*.

Teacher-Focused Interventions

This broad category includes interventions used by teachers to help students learn content presented in text and/or lecture. These teaching procedures or devices, sometimes referred to as content enhancements or adaptations, are designed to help students with disabilities access the curriculum without *watering it down*. This is done using various methods including highlighting critical information and graphically depicting content in ways that make relationships between related concepts apparent and concrete. We have categorized types of teaching devices for descriptive purposes but to some extent there is overlap between them.

Advance organizers. Sometimes referred to as creating a *learning set*, advance organizers (AO) are used to provide students, verbally and/or in writing, information prior to a lesson. This information includes the content and structure of the teacher's presentation. While the complexity and detail of an AO may vary, there are a number of typical elements or components commonly included (Lenz, Alley, & Schumaker, 1987; Lovitt, 2000).

Components of AO's that have some empirical support include an interactive review of previous content related to the upcoming presentation, a clear statement of the learning objective, expectations for the students, and discussion of the relevance and importance of the information to be presented. Another activity that may benefit students is pre-teaching new concepts and vocabulary as part of the AO process. It appears that a structured presentation of these concepts using multiple examples helps students understand the upcoming lecture better and retain information longer.

It is not clear from existing research whether all common elements are needed to improve student comprehension of presented material. It does seem clear that many students with learning disabilities need to be taught how to benefit from an AO and that merely providing one is insufficient for ensuring student learning. Students, who do not benefit from an AO, can be helped to do so by using techniques sim-

ilar to those used in the strategic instruction procedures mentioned earlier. These include the teacher explaining the purpose and rationale for an AO, describing each component using examples, and providing a worksheet organized by the AO components and prompting students to write notes on it. An example of an AO and how it might be delivered is presented in Figure 3.

Figure 3.

Example advance organizer for a lesson on paragraph writing.

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1. Inform students of the purpose of the AO

Good morning class, let's get started on our lesson. As usual I will start with an Advance Organizer. Remember, the purpose of this organizer is to help you focus on what you are going to learn, how you are going to learn it and why it is important to learn. To help you do that I will be going over some background information, introducing some new terms and explain my expectations for what you will be able to do. I have provided you with an AO worksheet to take notes on while we do the AO together.

2. Identify the topic and the expected outcomes

Today we are going to continue our work on writing paragraphs. Specifically we are going to begin learning about how to write different types of paragraphs. When we are finished with this unit, you will be able to write a variety of paragraph types correctly.

3. Elicit and provide rationales for learning the content

Who can remember why it is important to be able to write clear and correct paragraphs? In what kinds of situations would we need to write these kinds of paragraphs?

4. Provide a specific review of prerequisite skills and reteach if necessary.

Before we get started, lets see if you remember some of the information we have covered so far. First, what do we typically begin a paragraph with? Correct, a topic sentence. And, we talked about two types. What are they? Yes, a specific topic sentence and a general topic sentence. Who can give me an example of each? Great.

We said that typically a topic sentence is followed by what kind of sentences? Right, detail sentences. Somebody give me a detail sentence for the specific topic sentences just generated. Great. How about a detail sentence for the general topic sentence? Excellent, these sentences all met the criteria for a good detail sentence.

We also discussed the concepts of point-of-view as well as verb tense. Why is it often important to keep these consistent in our writing? Great reasons.

And finally, what do we end a paragraph with? Yes, a Clincher Sentence. Everybody, write a clincher sentence for this paragraph that I am handing out.

5. Introduce new vocabulary and specific focus of the lesson

Today we'll start learning about how to write different types of paragraphs. We will start with the sequential paragraph. What does the word "sequential" mean? So what do you think a Sequential Paragraph is? Sure it is a paragraph that describes something that happens in a certain order. If the information in a paragraph is of a sequential nature and you don't write in a sequential order what might happen to the reader? Sure, they will get confused.

6. Provide a framework, indicate actions and specify outcomes

We will go through this lesson in the same way as usual. First, we will define the concept (Sequential Paragraph and types of Sequential Paragraphs) using examples and nonexamples. Then I will describe and model how you apply the concept in your actual writing. While I am describing and modeling I expect you to take notes. Then we will practice writing a Sequential Paragraph together in our cooperative groups. Remember, I will be helping you as much as you need at first. Then you will begin to write more and more on your own until you can write a great Sequential Paragraph by yourself. Any questions? Okay, let's get started!

Study guides. These are outlines or worksheets containing a sequence of main ideas, statements, or questions taken from a textbook that help students focus on critical information. Typically, students fill out missing information or answer questions on the study guide during or after reading a textbook chapter. Figure 4 is an example of the kinds of items that might be found on a study guide.

Figure 4.

Study guide questions for this article.

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1. What are two student-focused interventions that are effective with adolescents with learning disabilities?

2. Two reasons why many adolescents with learning disabilities have difficulty in mastering secondary level curriculum include (a) dysfluency in basic _____ skills, and (b) ineffective and inefficient _____ - _____ strategies.

3. Self-management procedures include self- _____, self- _____, and self- _____.

4. Advance Organizers can be effective instructional tools because
a. they focus student attention on the content-to-be-learned
b. they help teachers better organize their instruction
c. they make sure students have prerequisite skills/ knowledge needed to benefit from the currentlesson
d. all of the above

The type and level of support provided by a study guide is often necessary for students with learning disabilities due to their difficulty identifying relevant information and general reading/studying skill problems. These difficulties are exacerbated by texts that include a dense (and often disorganized) concentration of novel concepts. Use of study guides with students with learning disabilities generally results in better test performance than when they are asked to study on their own (Lovitt, 2000).

Two basic approaches have been employed when using study guides, teacher directed and student directed. In the former case, the teacher instructs students to fill in the guide after they have read (or reread) a chapter. Using an overhead projector, the teacher reads the guide, provides missing information, and directs students to fill in their guide. The teacher can also ask students what the answers are (either as unison or individual responses) and if the answer is correct, uncovers the right answer on the overhead. Students then copy the answer. If a student does not know the answer, the teacher provides the page number in the text and the student locates and states the correct answer. Student-directed use of study guides is a simple procedure: students fill out the guide on their own. Another variation of a student-directed procedure is when the guide is filled out as a cooperative activity with dyads or small groups. Which method of study-guide completion is most appropriate appears to depend on the ability level of the students, with lower performers clearly needing more teacher direction. However, some students participating in the published research studies did as well or better using the guide individually.

Study guides can be further individualized in terms of referential cues. That is, some guides include page numbers and paragraph numbers (or just page numbers) students use to locate answers in a text. Again, the decision whether to use cues (or at what level) will depend on past performance in using the study guide. But it does appear that study guides incorporating multiple referents are typically more effective.

Finally, a variation of the study guide can be used when taking notes from lecture. This intervention, called *guided notes,* involves providing students a handout that is essentially a transcript of the lecture with key words or phrases omitted. As the teacher lectures, students fill in the blanks. Two variations have been researched: use of a short form (1 to 3 words missing at a time) and a long form (4 to 8 words missing). Preliminary findings favor the short form in terms of test performance and student preference.

In summary, study guides and guided notes appear to be an effective way of helping students with learning disabilities to learn content and perform on tests, and to do so across content areas (e.g., science, social studies) (Horton & Lovitt, 1989; Horton, Lovitt, & Christensen, 1991). However, some qualifications do remain. First, this approach seems to work best with factual level information versus more complex concepts and higher order skills. This is not surprising given the factual nature of the information on the guide and how it is presented. Relatedly, some research shows that in order to get improvement on test scores, the test has to reflect the information and format of the study guide. Finally, it should be noted that while performance on classroom tests improved, students with learning disabilities still scored lower than class average, with most scores on tests below 80%.

Graphic organizers. A graphic organizer (GO) is a visual display that makes relationships between related facts and concepts more apparent and explicit. These relationships can be temporal, spatial, semantic, sequential, hierarchic, or comparative. Each organizer contains information about an important or overarching concept from the students' textbook or a teachers' lecture.

This teaching tool, sometimes referred to as a *concept map, visual display, or concept diagram* helps teachers organize information so students can see that the content they are learning is part of a *whole* and not just unrelated facts. Also, making the connections between related material more concrete and explicit assists in student understanding as well as recall. Similar to the study guide, students are given the organizer on a piece of paper and are responsible for filling

Figure 5.

Graphic organizer used to define a concept.

Concept name:	Democracy

Definitions:	A democracy is a form of government in which the people hold the ruling power, citizens are equal, the individual is valued, and compromise is necessary.

Characteristics present in the concept:

Always	Sometimes	Never
form of government	direct representation	king rules
people hold power	indirect representation	dictator rules
individual is valued		
citizens equal		
compromise necessary		

Example	Nonexample
United States	Cuba
Mexico	Iraq
Germany today	Germany under Hitler
Athens (about 500 BC)	Macedonia (under Alexander)

From Bulgren, J., Schumaker, J. B., & Deshler, D. D. (1988). Effectiveness of a concept teaching routine in enhancing the performance of LD students in secondary level mainstream classes. *Learning Disability Quarterly, 11,* 5-6. Reprinted with permission.

in missing information. Figures 5 –7 illustrate different formats of GOs.

GOs can also be used during a lecture or filled out by students as they read through their textbook. GOs can be used before or after students read the text. It is unclear at this point if GOs are more effective when used as pre-organizers or as post-organizers (or both). Construction of a GO is completed following a general set of steps which include (a) identifying key/important concepts and related facts/vocabulary in the students textbooks, (b) sequencing the concepts, (c) selecting a format (e.g., hierarchic, diagram, compare-contrast, timeline, etc.) that makes the most sense given the nature of the information and the goal of instruction, and (d) constructing the GO in a manner which best illustrates the relationships between a concept and related information (e.g., use of arrows, boxes, numbering).

When presenting the GO in a lecture, effective teaching behaviors should be implemented. Such behaviors include (a) using an advance organizer, (b) providing an overview of the GO and its purpose, (c) asking students to think about key words and concepts from the chapter, (d) defining the overarching concept, (e) presenting examples and non-
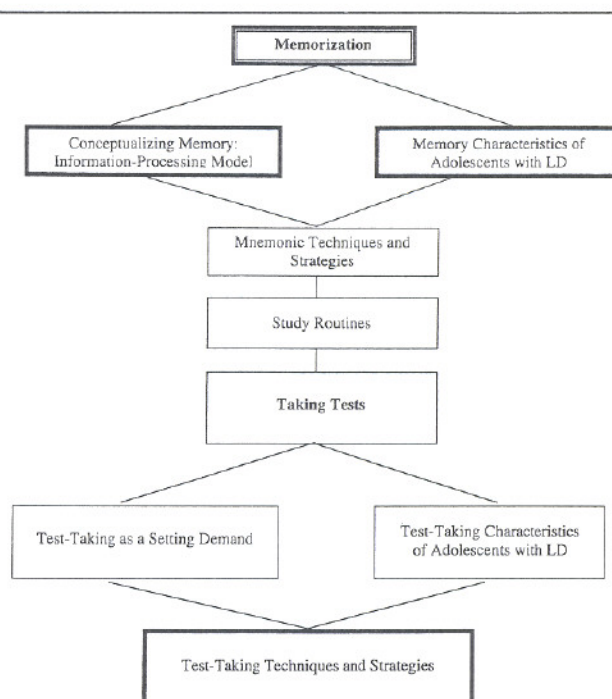
Figure 6.

Graphic organizer used to show relationships.
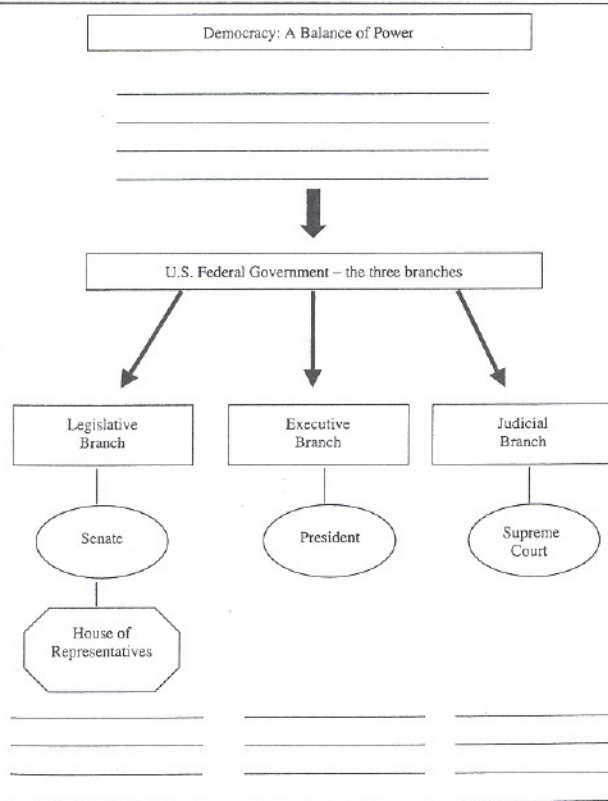
From Hughes, C. A. (1996). Memory and test-taking strategies. In D. Deshler, E. Ellis, & B. Lenz (Eds.), Teaching adolescents with learning disabilities: Strategies and methods (pp. 209-266). Denver, CO: Love.

Figure 7.

Graphic organizer used to show organization of a chapter on memory and test taking.

From Hughes, C.A. (1996). Memory and test tatking strategies. In D. Deshler, E. Ellis, & B. Lenz (Ed.s), Teaching adolescents with learning disabilities: Strategies and methods (pp. 209-266). Denver, CO: Love.

examples focusing on the critical attributes of the concept, and (f) keeping the students involved by asking questions and eliciting other responses. As the lecture progresses, students are responsible for filling in the missing information on the GO.

Overall, the use of different forms of GOs (e.g., concept diagrams, visual displays) appears to help students better understand and retain information from their texts and teacher lecture (Horton, Lovitt, & Bergerud, 1990). As with study guides, it appears that this approach is typically more effective when the teacher systematically directs the activity versus a more student-directed approach. Too, while students score higher on their classroom tests when GOs are used appropriately, many students with learning disabilities still have not scored as high as their counterparts without learning disabilities.

Memory enhancements. One study (Bulgren, Schumaker, & Deshler, 1994) has examined use of memory enhancement devices (mnemonics) as a closing review for lectures given in general education secondary classrooms. This enhancement is a routine designed to improve student retention of lecture content by using mnemonic devices with key vocabulary presented during the lesson. Three types of

mnemonic devices were used: (a) first-letter mnemonics (using the first letter of each word in a related list to form an acronym), (b) mental imagery (forming a mental picture that links two pieces of related information, and (c) keywords (using the sounds heard in an important vocabulary word, relating that sound to a familiar word, and then forming a mental image or drawing that links the vocabulary word and the familiar word).

Prior to teaching the lesson, the teacher identifies important content (typically factual level knowledge) and then, based on which of the three mnemonic procedures is deemed most appropriate, constructs the memory enhancement. The teacher progresses through the lecture, concurrently writing the designated facts on the board and describing the mnemonic to the students. At the end of the lecture, the content related to the mnemonics is reviewed. This review began with students being cued that the content to follow was important and to take notes. As each concept/vocabulary word was reviewed, students were told which of the three types of memory devices were to be used. The teacher then linked, in writing, the concept with the memory device. Finally, the mnemonic device was reviewed. Students, both with and without learning disabilities, appear to benefit from this routine, scoring higher on recall tests than students who receive a more typical lecture.

Summary of Teacher-focused Approaches

It appears there are several teacher-focused procedures that have some empirical support for their use. Also, these teaching methods do not water-down content and in fact often benefit students without learning disabilities as well as those with learning disabilities. However, there are some practical issues that need to be highlighted. First is the issue of efficiency. Efficiency has to do with the interaction of the amount of time needed to prepare/instruct with the amount of student learning that results. It is unclear in some cases how much time is necessary to prepare some of these devices and the information that is known indicates that the effort is not minimal. For example, it appears that it takes at least one hour to construct one study guide for a 1500-word passage, not an insignificant amount of time especially considering the number of words in a textbook. Collaboration between general and special educators and may cut down on the time commitment needed.

Another issue is the expertise needed to construct and use content enhancements. These are not particularly easy to construct and require specific knowledge of instructional content and methodology. As stated earlier in this article, we cannot provide sufficient detail that would result in proficient use of these techniques. Well designed pre-and inservice training on the construction and use of these research-supported interventions is obviously needed.

Summary of Student-focused Interventions

We identified several studies (e.g., Maheady, Sacca, & Harper, 1987, 1988) that used similar forms of peer tutoring to improve classroom test performance of all students, including those with learning disabilities. One form, Classwide Student Tutoring Teams (CWSTT), requires small groups of 3 to 5 students ranging in ability, to work as a team. Working in a game format, students earn both team and individual points for correct responses, making corrections, displaying appropriate tutoring behaviors, and quiz performance.

To set up CWSTT, the teacher first provides 1 to 2 days of instruction on content to the class. Teams are then randomly established and students within each group rotate peerforming as the tutor asking peers questions on content presented earlier by the teacher (e.g., how to solve certain types of math problems). If one of the team states the correct answer, it is acknowledged by the tutor and points recorded. If an answer is incorrect, the student making the error must complete the problem correctly several times. Additionally, students complete worksheets and take quizzes.

A similar procedure, Classwide Student Tutoring (CST), begins with a day of teacher-directed instruction in a content area (i.e., social studies). On the second day the class is divided into two teams (e.g., the red team and the blue team). Within each team, students are paired and complete study guides prepared by the teacher. The tutor and tutee roles are switched after 15 minutes. Again, points are earned for correct answers and following procedures (i.e., good tutoring behaviors).

Regardless of the form of peer tutoring activity, it appears necessary for teachers to spend time training students how to be effective tutors in terms of providing both positive and corrective feedback and recording responses. Teachers also need to periodically and randomly monitor responses of students when they are in both roles. It also seems to be good practice to re-form teams every couple of weeks or so.

In summary, there is support for this type of intervention as an effective way to practice teacher-presented information and in a variety of content areas (e.g., science, social studies, math). Also, worth noting is that, to date, peer tutoring as been effective when implemented as same grade tutoring (versus cross grade or age tutoring) and using heterogeneous grouping by ability level.

Summary

The purpose of this article is to present an overview of types of interventions shown to improve the performance of students with learning disabilities in secondary general education classrooms. The reason for providing this overview is so teachers have a starting point for deciding which interventions to use with their students. This is the beginning

point for bringing evidence-based strategies into the classroom.

Based on our analysis of this research, it appears there are a number of promising interventions that can (a) help students become more efficient and independent learners, (b) guide teachers when they plan and deliver instruction, and (c) assist students to practice newly acquired information. It also appears that these procedures are generally effective for all students in general education classrooms and do not require teachers to significantly reduce their expectations.

However, one consistent theme we garnered from reviewing this research is that most of these techniques take significant amounts of time and effort to plan, construct, and implement in order for students with learning disabilities to benefit from them. There are no quick fixes. Nor is any single intervention approach in isolation sufficient to ensure students with learning disabilities perform at the same level as their peers without learning disabilities. It appears a variety of approaches are needed, including learning strategies, content enhancements, peer-mediation, and the judicious use of technology.

Obviously more research is necessary, especially with regard to teaching *higher order* information, generalization of acquired skills and knowledge, problem solving and the types of instructional arrangements/setting (e.g., resource class, general education class, co-teaching) needed for success. Until then, teachers can use the interventions outlined in this article with some measure of confidence that they work.

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Appendix A: Research Bibliography
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