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Content Enhancement: A Model for Promoting the Acquisition of Content by Individuals with Learning Disabilities

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Introduction

In evaluating the educational progress of students with learning disabilities, it becomes clear that educators face several challenges related to intervention. The first is to find good models of instruction that can be effectively and efficiently applied to instructing individuals with learning disabilities. Indeed, it can be argued that successful pedagogy may be the highest stage of learning in a discipline; a stage that deserves a place as the seventh level on Bloom's taxonomy (Shulman, 1989). Such a view of pedagogy challenges all researchers in the field of learning disabilities to carefully evaluate intervention research to identify pedagogy that is consistent with the information-processing characteristics of the individual with learning disabilities. A second challenge is to understand and make instructional decisions related to the interactive nature of teaching and learning. Research on how to teach students to acquire more efficient and effective strategies and how to become more strategic learners and performers should go hand in hand with research on how the teacher can *induce* more strategic processing of information. Students' strategic processing of information can be enhanced by teacher expositions and actions during the processes of planning to teach, teaching, and selecting and using appropriate curriculum materials. In light of these two challenges, the purpose of this chapter is to present an instructional model on promoting the acquisition of content by individuals with learning disabilities. The model has been designed to focus on the assumptions and components potentially required to assist content-area teachers in planning and presenting content in a manner that is sensitive to the information-processing characteristics of students. Within the context of this model, this chapter presents a theoretical rationale for the use of specific instructional procedures, describes the dimensions of the procedures, and discusses how teachers might begin to think about organizing and implementing this type of instruction for individuals with learning disabilities.

Information Processing and Pedagogy for Students with Learning Disabilities

A learning disability is usually identified within the context of instruction. Children are referred for learning disability services only when they do not respond to traditional instruction commensurate with their ability and comparable to the rate of their peers. As a result, the construct of learning disabilities is a contextualized one that requires an examination of the characteristics of the individual in terms of the demands present in the environment. An information-processing orientation to intervention research consistent with the construct of learning disabilities, therefore, must include an examination of the information-processing abilities and responses of the individual in the context of related instructional demands and pedagogy. Such a perspective may advance our understanding of the overall construct of learning disabilities. In fact, a number of individuals have raised the same point. For example, Farnham-Diggory (1986) has argued that the issue of definition and identification of learning disabilities will only be fully addressed once "the processes identified in the laboratory enter into the performance of school tasks" (p. 134), and Swanson (1987) has argued that a full understanding of learning disabilities will only take place when we take into consideration the interaction between the student's information-processing abilities, experiential history, and environmental context. Clearly, student performance at complex information-processing stages must be studied within the educational context so that appropriate pedagogical procedures can be developed to promote the use of strategies within that context.

Instructional Implications of Information-Processing Theory for Students with Learning Disabilities

Consideration of the instructional implications of information processing has not been the traditional focus of information-processing research. Most of the research has focused on the identification of dysfunctions rather than on appropriate pedagogy. For example, some information-processing research has focused on dysfunctions in isolated mental components as an explanation for a learning disability. Consequently, a number of researchers have concluded that many children with learning disabilities do not differ from other children on elementary processes related to perceptual identification or discrimination, serial ordering, cross-modality integration, selective or sustained attention, and basic short-term memory capacity (e.g., McNellis, 1987; Morrison, 1987; Morrison & Manis, 1982; Samuels, 1987; and Vellutino, 1979).

Other researchers have investigated higher-order processes as an ex-

planation for learning disability (e.g., Torgesen, 1977, Wong & Jones, 1982). These studies have often focused on whether or not students can be instructed to use the higher-order processes or strategies. While research on instruction in discrete strategies has demonstrated dramatic improvements in the performance of individuals with mental retardation or learning disabilities (see Butterfield & Belmont, 1977 and Campione & Brown, 1977, for reviews), evidence from the early studies indicated that these subjects had difficulty generalizing the use of strategies to situations different from the training conditions (e.g., Borkowski & Cavanaugh, 1979; Brown, 1978; Ellis, Lenz, & Sabomie, 1987). Based on these findings, subsequent studies were conducted in which instruction on strategies included the delivery of metacognitive information about the strategy that related to characteristics and identification of situations where the strategy might be useful. These studies demonstrated transfer of the strategy to related tasks (e.g., Brown, Bransford, Ferrara, & Campione, 1983) but not to academic tasks such as reading, writing, and arithmetic.

Instruction for Students with Learning Disabilities

Problems in the generalization of specific strategies to other situations have prompted the design of interventions which, in turn, has led to research on "strategy systems." Research on such strategy systems has focused on instruction of students in strategy interventions that relate to general sets of academic demands and contexts (see Brown & Palinscar, 1987, and Deshler & Schumaker, 1988, for a review of two lines of research in this area). These researchers have identified specific strategies related to academic tasks and then have carefully defined specific pedagogy about how the strategies were to be taught within the context of academic demands. Their studies have demonstrated that well-designed instruction can result in a dramatic increase in the acquisition and generalization of strategies for both elementary and secondary school-age students with learning disabilities.

Nevertheless, most research on instruction of individuals with learning disabilities has focused on pedagogy as only a secondary area of interest while the primary area has been on the nature of the strategy learned by students. Ideally, as replications of instructional methodologies across academic areas continue to be conducted, opportunities for analytical comparisons of instructional procedures will increase. These types of replications are most notable in the programmatic research on "direct instruction" procedures developed by Doug Carnine and his colleagues, the "reciprocal teaching" model developed by Ann Brown and Annemarie Palinscar and their colleagues at the University of Illinois Center for the Study of Reading, and the "stages of strategy acquisition and generalization" developed by Don Deshler and his colleagues at the University of Kansas Institute for Research in Learning Disabilities. While there

are distinct differences in these methodologies (e.g., in the role and degree of specificity in teacher actions and talk), all the models adopt the idea that "expert support" is provided by the teacher during the early stages of learning but is faded as instruction proceeds and as the student becomes successful and assumes the primary responsibility for learning.

It appears that general steps or patterns of instruction have been found to be more effective than others. However, instruction of individuals with learning disabilities has not always been successful when these general procedures have been utilized, especially in the regular classroom environment. In other words, even when specialized and intensive instructional procedures especially designed to promote the learning of individuals with learning disabilities have been utilized, some students within the population still have difficulty. For example, while Palincsar (1986a) reported that 78% of the experimental group met the established criterion (versus 19% in the control group) when reciprocal teaching was applied, it is evident that not all the experimental group met the criterion. In addition, in studies on the strategy instruction conducted at the University of Kansas Institute for Research in Learning Disabilities, student success has often been controlled by the careful selection of students who have demonstrated mastery of specified prerequisites essential for the intervention (e.g., reading at the fourth grade reading level). While this may be a harsh evaluation of very successful and powerful instructional methodologies, it highlights the outstanding lack of knowledge about the qualitative features of instruction, the interaction that these features have with prior knowledge, and the ability of teachers to make instructional decisions about learners within general sets of instructional procedures.

Information-Processing Theory and Pedagogy

Clearly, not all information-processing research has concentrated on instruction for students with learning disabilities; other researchers have focused their work upon the critical dimensions of instruction for all students and the role of the teacher as instructor. Turnure (1985, 1986) has suggested that research on cognitive development should examine the interaction among a number of dimensions including: (a) the characteristics of the learner (skills, knowledge, attitudes); (b) the learning activities (e.g., attention, discrimination, rehearsal); (c) the nature of the criterion task (e.g., recognition, recall, transfer); (d) the nature of the materials (e g., sequencing, structure, appearance, difficulty), and (e) the instructional agent (e.g., how he or she describes, questions, sequences instruction, models). Turnure suggested that the teacher is the central organizer of the various dimensions of instruction. A model that emphasizes the teacher's role as the primary "learning situation organizer" places great responsibility on the teacher. Inherent in such a model is the assumption that the

teacher has sufficient knowledge and experience to enhance learning and to successfully make decisions that provide for an appropriate balance among the dimensions Turnure described.

Description of Teacher's Planning and Teaching Routines

Many teachers appear to be inflexible once a teaching plan has been made. In a review of research, Clark and Peterson (1986) found that the structure of the "problem space" within which teachers and students operate is defined early in the year and changes little throughout the year (as cited from Anderson & Evertson, 1978; Buckley & Cooper, 1978; Brown, 1988; Shultz & Florio, 1979; Tikunoff and Ward, 1978). Clark and Peterson (1986) concluded from their extensive review of research on teachers' thought processes that ineffective teaching may stem, in part, from the inability of a teacher to efficiently process the variety and quantity of information that emerges during ongoing classroom interaction. Their review of the research on teacher planning indicates that teachers tend to enter the classroom with specific plans and expectations about the flow of activities and responses of students. Once teaching has begun, very little conscious decision making occurs. In fact, teachers often utilize routines for simplifying their decision making within the class as much as possible. For example, Shavelson and Stern (1981) noted that teachers often used heuristics (implicit rules used without conscious awareness) that, in effect, helped them simplify the complexities of teaching. Lundgren (1972) found that teachers often pinpointed "steering groups" in deciding when a point had been understood sufficiently and the class could move on. The steering group usually consisted of the group of students performing in a range between the 10th and 25th percentile in achievement. The assumption appears to be that if the steering group understands the concept, so will the majority of the students in the group. This general view of the pervasiveness of preestablished routines is supported by Morine-Dershimer (1979) who indicated that teachers generally make only minor changes in their plans.

Many complex elements are, obviously, incorporated into the typical plan and flow of activities for a given teacher. However, the extreme complexity of teachers' lesson plans may be an explanation for the inability of teachers to easily deviate from these plans. Morine-Dershimer (1979) noted that teachers' plans were seldom fully reflected in written lesson plans, but that written details were nested within more comprehensive planning structures labeled "lesson images." Joyce (1978–1979) indicated that these lesson images were nested within a still larger construct called the "activity flow," and Yinger (1977) found that "routines" were established early in the year. Brophy (1984) indicated that teachers seem reluctant to change their routines even if they are not working well. One reason suggested is that established routines serve to provide predictability and

structure in the lesson for both teachers and students. As a result, abandoning these established routines can increase the chances for disruption in the classroom and may impose greater cognitive demands on the teacher for making new decisions about the lesson. Therefore, these "routines" may serve to reduce the complexity of teacher planning and teaching and increase the predictability of classroom activities.

Despite the potential value of set routines, overreliance on these routines may constitute another instructional problem: Some studies have indicated that when teachers are forced to move out of their preplanned routine, very few alternatives seem to be considered. For example, in a case study, Wodlinger (1980) found that most of the interactive decisions of the studied teacher were made after consideration of only one alternative. Wodlinger suggested that many decisions may become routinized, based on previous experience in which alternatives may be considered and then rejected. Thus, when dramatic discrepancies between lesson plans and the realities of the situation do occur, teachers rarely know how to reduce the discrepancy. Shroyer (1981) pointed out that teachers can respond to these situations in one of three ways: They can exploit the possible advantages to expand their teaching plans; they can respond briefly to the problem but return quickly to their original plan; or they can avoid responding at all. Teachers in this type of situation apparently do not have acceptable alternatives readily available. Morine-Dershimer (1979) described the teaching strategy used by teachers in this situation as "postponement," that is, either aborting the lessons or moving ahead with their original routine even though it is not working efficiently.

Suggestions for Improving Teacher's Planning and Teaching Routines

The value of being able to be flexible and to move out of these routines has also been described. Shroyer (1981) depicted the teacher as working on "automatic pilot" when things are going well but moving to a more active stance when unanticipated events occur. The thought processes that emerge from this "more active stance" may result in "teachable moments" which may provide teachers with opportunities to depart from their planned routines to take advantage of a chance to expand on a learning point. However, Shroyer found that only 8% of the teachers studied actually took advantage of these "teachable moments" to move outside a preestablished teaching plan. This is an ominous finding given Brophy's (1984) argument that effective teaching occurs most when teachers seek out and exploit these critical "moments of teaching" rather than sticking to a preconceived plan.

Given the wide range of student abilities in many classrooms and the likelihood that unplanned responses and situations will occur in a class-

room setting, teachers need to become aware that positive results can occur when they move outside their preplanned teaching routines. When Morine-Dershimer (1979) explored the changes that occurred in preplanned routines at various decision points in teacher lessons, she found that most decision points were handled by previously established routines. Furthermore, most of the teachers' information processing involved responding to their own preformed "images" of the flow of the lesson. Morine-Dershimer concluded that minor deviations from expected routines resulted in positive teaching decisions and hypothesized that when teachers were forced to deal with minor deviations from their expectations, their information processing on these decisions became more "reality oriented" than "image oriented." Essentially, the teachers had to respond to and interact with what the students were actually doing rather than to their own preformed images of the teaching routine. Apparently, this was more productive than a totally uninterrupted flow in the preplanned teaching because the teachers were receiving information about the students' learning as a result of the many interruptions (e.g., student queries and comments). This may be particularly important for teaching individuals with learning disabilities because McNair (1978–1979) found a trend toward the need for more teacher decision making when teaching groups of students likely to be at risk for school failure.

A number of conclusions can be drawn from this research on the critical attributes of instruction. First, teaching is a very complex task that requires a great deal of planning and decision making. Unfortunately, as Brophy (1984) contended, very few teachers become expert enough to function as effective decision-makers, particularly since decisions cover a wide range of content and method selection, adaptation, supplementation, evaluation, remediation, and adjustment of plans. The instructional task becomes even more complex when, in addition to content decisions, the teacher must also consider the needs of individuals with learning disabilities. Second, since classroom processes are clearly preformed and envisioned in the mind of the teacher before teaching begins, teachers are not always responsive to the unexpected problems and needs of students in the class. Individuals with learning disabilities may often present unexpected instructional problems and further complicate the instructional process; it is therefore unlikely that the teacher will be prepared to make the required adjustments during the teaching session. Third, teachers already tend to teach using routines and structures. Therefore, instructional procedures that address the needs of individuals with learning disabilities may best be conceptualized through the development of structured routines and instructional devices. These are specifically designed to promote effective and efficient information processing that can be incorporated into the teacher's planning and teaching processes. Fourth, since one goal of instruction is to make students independent learners, instructional practices should include procedures that promote student ownership and control of the instructional process. That is, the teacher may find that some of the decision-making responsibilities can be assumed by the learner if teaching is viewed as a collaborative process. This notion of a collaborative instructional process is also consistent with the "active" and "independent" learner orientation of an information-processing model. Fifth, teachers must be instructed in pedagogy based upon information processing and decision making and in the appropriate use of this type of pedagogy. In essence, teachers must be instructed in how to effectively and efficiently plan lessons that incorporate information about their students and the pedagogy that is suitable to them.

Information-Processing-Sensitive Pedagogy for the Content Areas

If teachers are asked to incorporate methods based on information-processing theory into their planning and teaching, then teachers must be supported in this process. This can be accomplished, in part, by helping teachers understand the characteristics of pedagogy that is sensitive to the information-processing ability of students and how information-processing theory can be translated into practice.

Characteristics of Information-Processing-Sensitive Pedagogy

For our purposes, "information-processing-sensitive pedagogy" refers to instruction, that:

a. Is fashioned and differentially delivered based on the teacher's knowledge of the range of information-processing and communication abilities of students (e.g., Deshler, Alley, Warner, & Schumaker, 1981; Lenz & Bulgren, in press).
b. Promotes student attention or reception of incoming information (e.g., Lenz, Alley, & Schumaker, 1987; Mayer, 1975, 1984, 1987).
c. Facilitates the activation of strategies that enable the student to access and integrate prior knowledge with to-be-learned information (e.g., Ausubel, 1960; Lenz, Alley, & Schumaker, 1987; Mayer, 1983).
d. Promotes the activation of strategies that enable the student to build logical or structural connections between and among incoming ideas and ideas already in memory (e.g., Bulgren, Schumaker, & Deshler, 1988; Mayer, 1987).
e. Encourages the active participation of the student in the learning process as a planner, implementor, and evaluator (e.g., Brown, 1978; Hughes, Schumaker, Deshler, & Mercer, 1988; Van Reusen, Bos, Schumaker, & Deshler, 1987).
f. Instructs the student in the "why, when, and where" aspects of information related to the use of knowledge (e.g., Brown, Day, & Jones, 1983; Lenz & Hughes, 1990).

g. Informs the student of progress and provides appropriate feedback in a manner that improves learning (e.g., Kline, 1989; Palincsar & Brown, 1984).
h. Leads the student in the learning process through expert scaffolding and proleptic teaching (e.g., Deshler & Schumaker, 1988; Vygotsky, 1978; Wertsch & Stone, 1979).
i. Takes advantage of the developmental and social contexts of learning by gradually moving from adult guidance and modeling to peer and student guidance and modeling (Allington, 1984; Palincsar & Brown, 1984; Lenz, Schumaker, Deshler, & Beals, 1984; Vygotsky, 1978).
j. Plans for and promotes the acquisition and integration of semantic, procedural, and strategic knowledge throughout all phases and types of instruction (Mayer, 1987).

However, simply identifying the characteristics of such pedagogy does little to assist in the translation of theory into practice.

Translating Theory into Practice

The process of translating theory into practice must focus on how instructional principles can be organized to affect classroom practice in a systematic and reliable manner. Consequently, the identification of pedagogy sensitive to an information-processing perspective requires a practical interpretation of information-processing theory. Ideally, such an interpretation would set the stage for the teacher to monitor and adjust the teaching process as necessary. That is, a teacher's instructional procedures must be designed to interrupt an existing information-processing sequence, if necessary, and then to externally guide or prompt the student's strategic processing of information in a more effective and efficient manner than would be possible if the learner proceeded alone. As a result, while the learner is processing information, the teacher is attempting to *hypothesize* how the learner is processing information. This, in turn, can lead to the modification of instruction in an attempt to alter how the learner is learning and performing.

To further accomplish the translation of theory into practice, it is necessary to reduce the complex nature of information-processing theory into a simpler framework while retaining the essential and powerful elements of the information-processing model. It is possible to think of pedagogy as accomplishing three primary purposes. These purposes deal with the student's awareness that learning is about to occur, the student's active and personal involvement in the learning process, and the student's willingness to use this new knowledge. First, the learner must orient himself or herself to the instructional situation by: (a) becoming aware that a learning situation or opportunity exists, (b) attending to the new information, and (c) drawing upon appropriate prior knowledge to contextualize or make logical associations with the new information. The major purpose of instruction at this stage of learning can be conceptualized as promoting an orientation to content learning. Second, the learner begins to understand the information by: (a) identifying concepts, (b) identifying similarities between different examples that indicate that they belong or do not belong to the same concept class, (c) making appropriate associations with prior knowledge regarding these concepts, and (d) distinguishing between important and unimportant pieces of information in the reconstruction of his or her knowledge base. The major purpose of instruction is promoting the understanding of content. Third, the learner must start acting on the new information by: (a) testing knowledge and the impact of this knowledge in the real world, (b) exploring the various dimensions of knowledge across situations, settings, and conditions, (c) applying knowledge to solve problems, and (d) ensuring that the knowledge is available for later access through self-practice and memorization activities. The major purpose of instruction at this stage is promoting independent activation of content. In short, three distinct instructional phases appear to emerge about which the teacher should be concerned: (a) Orientation, (b) Understanding and (c) Activation.

These three general elements have been supported by various instructional researchers. For example, Roth, Smith, and Anderson (1984) suggested that the phases of science instruction consist of: (a) preparation; (b) exploration; (c) acquisition; (d) application/practice; and (e) synthesis. Palincsar (1986b) described the stages of reciprocal teaching as including: (a) initial group review of strategies, importance, and contexts for use; (b) presentation of the task and cueing of the goal to be met and strategies to be used; (c) interactive and cooperative completion of the task with students taking turns as "teacher;" (d) "teacher" summary and group elaboration and clarification on what was learned; and (e) prediction about future learning and the appointment of a new "teacher." In addition, Rosenshine and Stevens (1986), from a review of "teaching functions," presented a synthesis of research on effective instruction that included these key instructional stages and aspects of presentations from research in the regular classroom environment. Therefore, the challenge in developing a model to improve content area instruction based on information-processing theory requires the researcher to consider how the conditions listed above can become part of the the teacher's approach to the teaching process.

Overview of the Content Enhancement Model

Wong (1985) has pointed out the importance of promoting content learning for individuals with learning disabilities. A model for promoting effective content learning through the careful *organization* and *delivery* of in-

formation by the teacher is currently being developed by researchers at the University of Kansas Institute for Research in Learning Disabilities (e.g., Bulgren, Schumaker, & Deshler, 1988; Deshler & Schumaker, 1988; Lenz, Alley, & Schumaker, 1987; Lenz & Bulgren, in press; Schumaker, Deshler, & McKnight, in press). While only portions of the model have been completely validated, the concepts that serve as the foundation for the model are based on findings from research across the areas of curriculum, instruction, educational and cognitive psychology, and special education. Therefore, this model can potentially serve as a guide to teacher thinking, planning, and teaching in the content areas.

Definition and Assumptions of the Content Enhancement Model

The model is based on the idea of "content enhancement." Content enhancement is defined as the process of teaching scientific or cultural knowledge to a heterogeneous group of students in which: (a) both group and individual learning needs are met; (b) the integrity of the content is maintained; (c) critical features of the content are selected, organized, manipulated, and complemented in a manner that promotes effective and efficient information processing; and (d) the content is delivered in a partnership with students in a manner that facilitates and enriches learning for all students. In order to accomplish this, six major assumptions have been made. First, it is the responsibility of the content teacher to present information in a manner that will promote student understanding and remembering of information to all students. Second, the processes of planning, teaching, and evaluating for learning should be based on careful consideration of the information-processing demands placed on the teacher as well as the student. Third, enhancements, consisting of carefully planned instructional routines and devices, should be utilized to enhance the delivery of content information. Fourth, the teacher must inform students of the enhancements that are to be used to enhance the delivery of information and, as a result, student learning. Fifth, the teacher must cue students when specific enhancements are being used to promote learning. Sixth, the teacher must purposely implement the enhancement in a partnership with students. And, seventh, the teacher should induce both himself or herself and the students to reflect on the enhancement and to evaluate its roles in learning and whether it has been an effective teaching/learning experience. Therefore, great responsibility is placed on the teacher to become the primary instructional organizer.

The Content Enhancement Model

The model is made operational through the recognition of at least three major components. The first component of the Content Enhancement

Model includes specific teaching routines that might be used to enhance or guide the delivery of major chunks of a content lesson, (e.g., routines designed to orient the students to information that will be learned, routines designed to help students understand concepts, or routines to promote active learning of new material). The second component consists of instructional devices that might be embedded in a routine to further enhance the delivery of content (e.g., devices designed to help the student to understand, remember, or organize information). The third component consists of procedures for planning instruction and organizing the content enhancement process daily and over time under both planned and spontaneous circumstances, (e.g, guidance in identifying important information, analyzing prior knowledge requirements of the students, etc.).

The integration of the major concepts involved in the teaching process that have been incorporated into the Content Enhancement Model are depicted in the diagrams in Figure 5.1. These diagrams illustrate what might be conceptualized as the unit of instruction. For our purposes, we will call this "the lesson," although the unit of instruction under consideration might be the entire course, a specific unit or a chapter as well as a daily lesson. The boxes represent the actual lesson that occurs. The portion inside the box not covered by the oval represents those aspects of the lesson not predicted in the preparation of the lesson. This is the portion of the lesson that is potentially not under the control of the teacher, for which the teacher does not know if he or she is influencing students or adequately imparting information, and for which desired outcomes are not achieved. The oval inside the box represents the *planned* portion of the lesson that is implemented. This is the part of the lesson that is predicted, is actually under the control and influence of the teacher, yields ongoing information regarding whether or not the students are understanding the information in the lesson, and results in the desired outcomes.

As shown in Figure 5.1, Diagram A, lessons typically consist of a beginning, a middle, and an end. The diagram also represents various areas of expertise that all teachers bring to the lesson, including subject matter knowledge and teaching methods. However, in certain lessons, if the teacher's knowledge and methods are not supplemented by an adequate repertoire of techniques to deal with the variety of responses that may occur in a classroom, a less than optimal portion of the lesson may be available for efficient delivery of content information. This is represented by the relatively large area of gray in Figure 5.1, Diagram A, indicating those portions of the lesson that did not evolve as the teacher had planned and over which the teacher did not have the control he or she would have wished. As a result, less than optimal levels of content is acquired by the students.

Diagram B, in Figure 5.1, indicates that the area inside the oval representing more efficient and effective instruction can increase when the teacher is sensitive to the information-processing characteristics of stu-

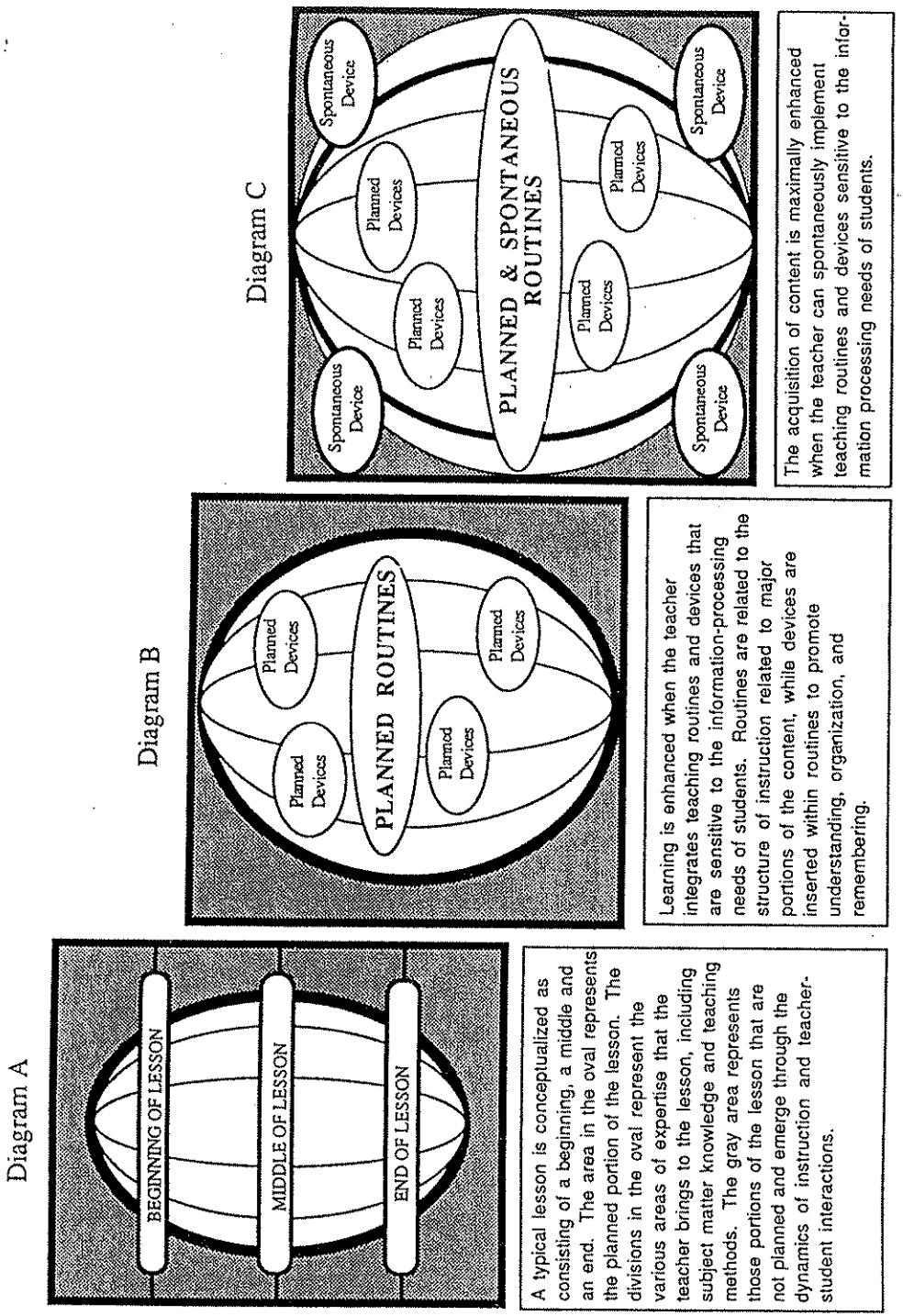

FIGURE 5.1. The content enhancement model.

dents. This diagram indicates the addition of teaching routines that are related to major portions of the content and/or teaching devices that are utilized within the routines to promote understanding, organization, and remembering. This facilitation of the processing of information for students with learning disabilities is the central thrust of the content enhancement process; it is accomplished by the infusion into the lesson of a variety of these teaching routines and devices. As demonstrated in Figure 5.1, Diagram B, this infusion of planned routines and planned devices increases the size of the oval and, theoretically, the success of instruction within the lesson.

It is naive to believe, however, that teachers can predict and plan for everything that takes places in a classroom setting. In reality, the teacher must be well-prepared before the lesson but must also be prepared for the unexpected that might occur during the lesson. Therefore, the teacher must be able to skillfully break out of planned routines and spontaneously initiate contextually appropriate routines that are not dependent on advanced preparation and refinement. It is the ability of the teacher to gain control, monitor student understanding and achieve the desired outcomes in the exceptionally difficult moments of teaching that may result in the greatest gains in teaching students with learning disabilities. This aspect of the Content Enhancement Model is represented in Figure 5.1, Diagram C. Here, those aspects of the lesson that fall into the gray area are further reduced by the use of additional, appropriate, and spontaneous teaching routines and teaching devices that are sensitive to the information-processing needs of students. Therefore, at the heart of the content-enhancement process is the use of specific routines and devices that can be used to enhance or enrich content learning. Other components in the model simply support or guide the effective use of these procedures.

Components of the Content Enhancement Model

In general, the routines and devices all appear to support or promote instruction consistent with three major goals. First, the teacher must become aware of the relationship between the various types of information that the student must learn and how this information can best be presented. This awareness would include the presentation of important concepts, delivery of background knowledge, discussion of textbook formats, descriptions of methods or processes, explanation of facts or themes, exploration and discovery of information or ideas, and promoting methods for generalization of information to other areas. Second, there must be an awareness of the problems that many students have in processing information. For example, the teacher must determine if there is a lack of background experiences, a gap in the understanding of key conceptual information, an unfamiliarity with processes or methods of inquiry, a difficulty with the written word or

textual formats, or an inability to generalize a specific skill from one area to another. Third, there must be an awareness of ways to make information more meaningful to the student. Such methods could include verbal expansions, verbal and concrete illustrations, graphics, or extended interactive routines that have been explained to the students. Each of the routines and devices discussed in the next two sections seeks to achieve these purposes.

The Teaching Routines

The teaching routines have been divided into areas relating to orientation, understanding, and activation. Each of these three areas will be discussed in terms of goals associated with routines, the background theory and research, and special needs of students with learning disabilities that may be addressed with each type of routine.

The Content Orientation Routines

Orientation is the process of preparing and directing a student's attention to what has been learned and then identifying its relationship to what is to be learned. The orientation process might include the following: gaining student attention and cueing the use of a specific orientation routine, identifying or reviewing previously learned information that is critically related to forthcoming information, identifying the key elements of the to-be-learned information, explaining learning goals, discussing specific instructional activities of how the information will be learned, personalizing learning through effective rationales, and identifying expectations. The teacher might think about preparing for the orientation process by reviewing what has potentially been learned by students, previewing what should be learned, and then making decisions about how students can be guided to learn the content. The teacher must rely on her (a) previous experiences with the content, (b) knowledge of the structure of the textbook or materials, (c) knowledge of the actual content, and (d) knowledge of how students will process the information. The teacher also must make judgments about the relative importance of the information to which students will be exposed. In general, the orientation process must place the current learning goals, at whatever level, in the context of what the student already knows and what outcomes are desired.

Brainin (1985) has presented the work of Feuerstein in the context of the orientation process. According to Brainin, Feuerstein's instructional mediation includes instruction for the teacher to: (a) explicitly explain purpose and predict what will occur, (b) interpret events in light of background knowledge, and (c) relate events to the student's prior knowledge and identify relationships between problems. This orientation process takes place within the overall context of scaffolding (Wood, Bruner, & Ross, 1987). Scaffolding is defined as the process of prompting a student to

complete a task that could not be completed by the student unassisted. Palincsar (1986b) has argued that scaffolding takes place at the very edge of the student's ability to perform and within what Vygotsky (1978) has called the "zone of proximal development." The purpose of the orientation process is to bring the student to the edge of this zone in an effective and efficient manner and to prepare the learner for information integration and understanding.

Most of the time, the orientation process is viewed as an activity that is initiated at the beginning of the lesson. However, the orientation process should continue throughout the content learning process. For example, at the beginning of a lesson, a teacher may present information related to the previous lesson and then integrate what the student knows with the topics that will be covered. The teacher may also explain the topic that will be covered, how it is organized, and what she considers to be most important. During the lesson, the teacher may continue to refer to the previously learned information as an anchor, note when specific topics are being covered, and then emphasize and review the organization of the information. Finally, at the end of the lesson (not necessarily at the end of the instructional period), the teacher may review the key elements and then check to see if students understand the key concepts and the organization of the information. Furthermore, the orientation process should be implemented at various instructional levels. For example, the teacher may spend one or more days providing an orientation to an entire subject area or course. The introduction of a new unit or chapter may also require the teacher to orient the student to a new area of information. In fact, it may be that the manner in which the overall conceptual umbrellas of a course, unit, and chapter are introduced, set up, and then reinforced are really the foundations to the orientation process and related routines.

The concept of orientation has emerged primarily from research in cognitive psychology in the area of "organizers." Interest in organizers initially centered on the use of "advance organizers" (Ausubel, 1960; Ausubel, Novak, & Hanesian, 1968). Ausubel et al. described the advance organizer as a tool to "provide ideational scaffolding for the stable incorporation and retention of more detailed and differentiated material that follows" (1968, p. 148). However, differential results from various research studies have indicated that the effects of the advance organizer are contingent on the circumstances under which it is used. Research on the advance organizer has indicated that it is most likely to promote learning when students do not have the background knowledge for a particular task, do not make the connection between prior knowledge and the to-be-learned information, and do not make the connections between relationships in the to-be-learned information (Mayer, 1979). Mayer (1987) concluded that advance organizers are successful and should be used when: (a) students lack the background knowledge necessary to understand to-be-learned information, (b) the goal of instruction is for the student to transfer or apply

learned information to new problems or circumstances, (c) a simplified or concrete model can be constructed that will be easy for students to learn and organize the information. Therefore, it is clear that the teacher's predications about the state of the learner and how the learner is processing information is a critical aspect of the use of the advance organizer.

Researchers have also explored the benefits of signaling important information, directing attention during lectures, using cues related to notetaking, and using post organizers to help a student process information (see review in Mayer, 1987). The results of various studies indicate that how a teacher cues information, pauses, and prompts review can significantly affect attention to important information (Aiken, Thomas, & Sheenum, 1975; Faw & Waller, 1976; Peters, 1972; Carter & Van Matre, 1975; Bretzing & Kulhavy, 1981). Simultaneously, the results of these same studies indicate that learning can be inhibited if students attempt to appropriately process information through notetaking, but the teacher does not adjust the presentation when information-processing demands begin to overwhelm the student.

While research on the orientation process indicates that the use of specific routines can promote learning, application of these routines with individuals with learning disabilities indicate that many of these individuals (a) do not independently recognize these routines when they are used by teachers (Lenz, Alley, & Schumaker 1987), (b) do not independently use lesson organizers and cues to promote learning during a lesson (Robinson, Deshler, Denton, & Schumaker, in prep.), and (c) can usually only benefit from the application of these routines when these routines are made explicit prior to, during, and after a lesson (Bulgren, Schumaker, & Deshler, 1988; Lenz, Alley, & Schumaker, 1987; Robinson, Deshler, Denton, and Schumaker, in prep.). Therefore, the key to making the "organizer" work to enhance learning appears to be related to the degree to which learners learn about the presence and use of these routines to enhance learning and are then prompted by the teacher to become actively involved in using organizers (Lenz, Alley, & Schumaker, 1987).

A study that directly examined the application of these concepts to the process of teaching content to individuals with learning disabilities was conducted by Lenz, Alley, and Schumaker (1987). In this study the investigators matched regular classroom content teachers with an individual identified as having a learning disability who was already in their class. Components associated with organizer use (beginning of a lesson, during a lesson, and after a lesson) were identified and the teachers were observed over a period of days to determine how they typically used organizers. Measures of student learning were also obtained. Teachers were then trained to use advance organizers and their implementation of the teacher-constructed advance organizers were then observed. While teachers implemented the teaching routines, very little change was observed on the measures of student learning. Students were then informed of the presence

of the advance organizer and were prompted to take notes and begin to use the advance organizer to organize learning. Improvement on the student measures was then observed. A key factor in the success of this routine was the student's awareness of the routine and the knowledge of how it could be used to facilitate learning.

In another study, Schumaker, Deshler, and McKnight (1989) investigated how student learning might be influenced when the advance organizer construct was expanded to include an entire lesson designed to orient students to an entire chapter. In this study, the teacher interactively went through a textbook chapter and discussed how the chapter fit with other chapters, hypothesized what the chapter was about, and paraphrased and discussed chapter titles and subtitles. Schumaker et al. reported that the results of the routine on student learning were promising but inconsistent. While test scores of individuals with learning disabilities improved an average of 10 percentage points in some classes, the same effect was not observed in all classes. In addition, the students never learned to internalize the routine. When the teacher stopped using the routine, students stopped engaging in the survey behaviors despite the positive effects on learning. Therefore, while it appears that surveying the chapter may be valuable, it may be that, for individuals with learning disabilities, in the absence of intensive strategy instruction in how to use a textbook, the teacher may need to be responsible for overt prompting of the orientation process. Moreover, specific teacher variables and content variables may also need to be considered in the development of a chapter survey routine.

While it may be possible to identify appropriate orientation routines, it is unclear what types of orientation routines are needed or will be used by teachers. For example, after Lenz, Alley, and Schumaker (1987) trained teachers to begin using advance organizers, the use of post organizers decreased. Teachers simply ran out of time at the end of the class period. Likewise, it is important to understand which types of orientation routines are most important to the learning of individuals with learning disabilities (e.g., the chapter survey or the lesson level advance organizer), which aspects of specific orientation routines are necessary and which are unnecessary (e.g., daily implementation, preview, review, rationales), and which form of delivery is most beneficial (e.g., graphic organizer, verbal organizer, student generated organizer).

The Understanding Routines

Before discussing the understanding routines, it is necessary to first consider the content understanding process itself. Although the process of "understanding" is certainly a fundamental and pervasive part of all learning, the demands of understanding involved in content area learning, as it exists in the middle and secondary school years, involves higher-order pro-

cessing strategies. Whereas the primary purpose of the orientation process is to promote awareness and readiness to learn, the primary purpose of the understanding process is the acquisition of new information *through* the integration of the new information with prior knowledge. Therefore, as the teacher moves from orientation to understanding, the teacher shifts the *focus* of the lesson from reviewing and predicting to integrating and storing.

Although researchers have not yet empirically derived the various types of content learning demands placed on students, a number of key demands can be identified for instructional planning. The major types of demands related to promoting the understanding of content area information appear to minimally include: (a) learning concepts; (b) applying or generalizing learned concepts to novel situations; (c) comparing and contrasting concepts; (d) learning rules and propositions (which specify the relationship between concepts); (e) learning and integrating main ideas and details; (f) learning procedures, processes, or sequences of actions; (g) learning cause-and-effect relationships; and (h) exploring problems and arriving at solutions. Therefore, the role of the teacher is to determine if one of these content learning demands is present (induced by either the text or the learning objectives and goals), to organize and manipulate the content in a manner that highlights the demands of the content; and to promote content acquisition in a manner consistent with learning goals. These general demands must, of course, be considered in light of specific course requirements. Indeed, the nature or characteristics of the content set the stage for the type of instructional procedures that are most likely to facilitate learning. Instruction that neglects to take this relationship into consideration may prove to be unsuccessful. Therefore, the first task of the teacher is to identify the content learning demands that are placed on students, then identify methods that help the student to meet these demands.

Theory and research on the understanding process provide the foundations needed for the development of the understanding routines. Research in the area of concept teaching is an area that has been investigated in promoting understanding in the content classroom, and a clear understanding of concepts and how to explain concepts often serves as a vehicle for clarifying understanding. Numerous researchers agree that, in essence, a concept is the category of class into which events, ideas, or objects are grouped (Bruner, Goodnow, & Austin, 1956; Gagne, 1965; Ausubel, Novak, & Hanesian, 1968; and Klausmeier & Associates, 1979). This grouping is done according to decisions made through the application of at least four different components (Klausmeier & Ripple, 1971). These components are (1) the attributes, properties, or characteristics by which things are placed in a specific category; (2) the rules by which these attributes are joined in a concept class; (3) the hierarchical patterns of supraordinate, coordinate, and subordinate concepts into which a concept fits; and (4) the instances or examples of a concept. For example, the concept of "democracy" has several attributes; among these are that it is a form of government, citizens are equal, the individual is valued, the people hold the power, and compromise is necessary. Second, these attributes are joined by a rule which states that all these attributes must be present in an example of the concept of "democracy." Third, "democracy" is a concept that fits into a hierarchical pattern in which the supraordinate concept is "political systems"; the instances that are coordinate with "democracy" are "socialism, "dictatorship," or "monarchy." Fourth, an instance or example of "democracy" is the government of the United States of America, and a nonexample is the government of China. A similar application of the same four analytical components to concepts in various classes allows the teacher to utilize a similar pattern that can guide student thought processes.

Emphasis upon the teaching of concepts has been widely emphasized in the development of classroom materials. Taba's (1971) teaching model for concept attainment incorporates these elements of a definition, and Becker, Engelmann, and Thomas (1971) used this definition in developing a programmed learning text. Specifically, it has been applied to science (Voelker, 1972) and social studies (Martorella, 1972), two important content areas. Another area of research that incorporates many aspects of concept teaching has been the research on semantic mapping and semantic feature analysis. These strategies encourage the placement of concepts into categories and relationships based upon students' prior knowledge. Research conducted by Johnson, Toms-Bronowski, and Pittelman (1982) has found that these two strategies positively affect students' acquisition of vocabulary. These are interactive teaching strategies that encourage student involvement through exploration of what the students already know about a word, other words related to that word, and relationships.

The needs of students with learning disabilities in the understanding process must also be considered. Based on current research and theoretical proposals in cognitive psychology (e.g., Gagné, 1985; Mayer, 1987) the role of the learner in the process of understanding content includes (a) receiving the content that is to be learned, (b) recognizing and organizing the relationships in the content, (c) retrieving knowledge already known that is related to the new content, (d) deciding the relevance of the prior knowledge and either deciding that the new information must be learned or must not be learned, (e) translating the content into networks of prior knowledge, and (f) making conclusions based on the integration of prior knowledge with new information. Therefore, if the student has difficulties at any point in the processing of information, the teacher must begin to prompt understanding through information-processing-sensitive pedagogy. Indeed, there may be a particular demand for this pedagogy when the class contains students with learning disabilities. Students with learning disabilities often enter secondary educational settings with deficits that make acquisition of content information difficult. A major problem is that students

with learning disabilities often lack required prior knowledge and concepts necessary to benefit from secondary curricula (Schumaker & Deshler, 1984). As Wong (1985) pointed out, lack of prior knowledge of facts and concepts that teachers tend to presume as foundations for advanced presentations become critical in secondary content areas such as science and social studies which build on students' previous knowledge. She indicated that the lack of content knowledge on the part of many students with learning disabilities must be addressed because students benefit from an optimal amount of prior content knowledge when they are attempting to learn new information of the same topic. As teachers explore the concepts they presume that students will know, find ways to assess students' knowledge of those concepts, and acquire techniques for delivering information about concepts in which the students are deficient, lack of prior knowledge will be addressed for all students.

Drawing on the research on concept teaching from across a variety of disciplines, Bulgren (1987) developed a method designed to promote concept acquisition in regular content classrooms that contained students identified as having learning disabilities as well as students considered normally achieving. Bulgren demonstrated that a given concept can be taught to low-achieving students by providing students with good examples of members in a concept class, then moving on to matched presentations of examples and nonexamples to allow the students to practice discrimination of members of a concept class. Students were also guided by the teacher to identify the critical features of each concept. For example, all "automobiles" have wheels and an engine, but may vary widely in color and design and may still be considered an automobile. Careful attention to a given concept would necessarily include a well-constructed definition and a careful naming of the concept. Ideally, the teacher should use concept teaching to extend the interaction between the teacher and student to insure that the student becomes an active participant in exploring critical characteristics of a concept and evaluating various examples for membership or nonmembership in a concept class.

While there are probably many sets of procedures that can be used to promote the understanding of low-achieving students in the content areas, few have been validated. Therefore, the need exists to explore other procedures that could potentially enhance understanding. In addition to concept teaching, a few of the important content learning demands for which specific procedures must be developed include (a) applying or generalizing learned concepts to novel situations, (b) learning procedures, processes, or sequences of actions, (c) demonstrating knowledge of cause and effect relationships, and (d) identifying problem/solution relationships.

The Activation Routines

Activation is the process whereby the student is induced by the teacher to assume primary responsibility for learning the content. In the basic

academic skill areas of reading and mathematics, the activation process is usually thought of as the practice phase of instruction. During the skill practice phase, the teacher controls the early stages of practice to insure accuracy, guides students through the various aspects of skill mastery, and finally leads the student to an independent practice level. However, in the content areas, the activation process is usually achieved through assignments in which the student must independently find, manipulate, memorize, and then express information. The focus is not on the acquisition of skills; the focus is on the acquisition of content. A number of general guidelines can be identified across studies that suggest how a teacher can induce students to become active in learning. In general, these guidelines prompt the teacher to: (a) apply principles of information-processing theory to task construction; (b) induce learning and task completion by compensating for a student's ineffective or inefficient strategies by the way assignments are structured and delivered; and (c) apply principles of social learning theory to increase the probability of facilitating meaningfulness of information.

Theory and research on the activation process are available to provide support for the development of the activation routines and the incorporation of the guidelines presented above. Support for the concept of activation can be found in cognitive psychology. Craik and Lockhart (1972) conceptualized information processing as a continuum of levels of processing. The range of superficial processing to deeper level processing is purported to affect *how well* material is learned and *how durable* that learning proves to be. When difficult information is processed, a deeper level of comprehension is required. In addition, the more deeply the information is processed, the more durable is the memory trace and thus the learning (Houston, 1981). Teachers facilitate deeper level processing when they provide students with opportunities to practice content knowledge previously presented. The role of practice in the acquisition and retention of new knowledge has also been studied over the years. In a review of research related to practice, Joyce and Weil (1986) identified six principles of effective practice: (a) systematically move students from structured and guided practice to independent practice or homework; (b) provide short, intense, highly motivated practice periods; (c) monitor the initial stage to prevent students from practicing errors; (d) require an 85 to 90% level of accuracy at each level of practice, (e) distribute practice sessions over a period of time; and (f) provide practice sessions immediately after new content has been presented and continue frequently until independence is achieved. These principles must, of course, be viewed in light of actual classroom practices.

In addition to research related to an individual's ability to process information, other theory and research has focused on the value of activities based upon interaction among individuals. It may be particularly important to be aware of students who do not have skills that enable them to successfully complete assignments on their own. In such cases, the teacher may

need to structure assignments in a manner that will compensate for the student's lack of effective and efficient strategies. Based on Vygotsky's (1978) position that much of learning is mediated through social interaction, peers can be a valuable resource in the activation process. Many researchers have found the cooperative learning model to be an effective means of promoting skill and content practice. In this model, students work together in heterogeneous ability groups of three to six members. Through the pooling of skills, knowledge, and resources, students complete the assignment in a cooperative fashion. In a review of more than three dozen methodologically adequate experiments, various cooperative learning methods were found to have more positive effects than traditional control methods on student achievement, time on task, and other social outcomes (Madden & Slavin, 1983). Similarly, the effectiveness of peer tutoring is strongly supported by research. For example, Maheady, Sacca, and Harper (1988) found classwide peer tutoring to enhance the acquisition of social studies content knowledge.

While it is possible to categorize the types of assignments required of students, the effect of these assignments on the success of students in the content learning setting has been more difficult to determine. Nevertheless, we will review literature that addresses the active involvement of students in the learning process through a variety of procedures including homework assignments, seatwork assignments, assignment completion procedures, segmentation of content and cooperative learning procedures; where available, research specifically related to students with learning disabilities will also be addressed.

From a broad perspective, research in the area of "homework" indicates that the more time a student spends working on homework, the higher his or her achievement (e.g., Austin, 1979; Fredrick & Walberg, 1980; Keith & Page, 1985; Walberg, 1984), even when researchers have controlled for such variables as socioeconomic status and ability (e.g., Coleman, Hoffer, & Kilgore, 1981; Page and Keith, 1981; Wolf, 1979). Harnischfeger (1980) found that this relationship was consistent across subject-matter areas even as early as fourth grade. Polachek, Kniesner, and Harwood (1978) also found that less able students can compensate for their lower ability by increasing the amount of homework completed. However, these findings have almost always been tempered by qualifying statements on the positive effects of homework such that as made by Keith and Page (1985) who completed their review of the research on the benefits of homework with the statement, "Of course, care should be taken that the assignments are appropriate for the child's ability and achievement levels" (p. 356). As a result, teachers have often been left with the challenge of assigning more homework with little direction related to appropriate means of accomplishing this in the content areas.

In addition to homework, some research on assignments related to seatwork has been conducted at the elementary school level. For example,

Anderson (1984) found that the most important part of assigned seatwork, for both high and low achievers, was to "get it done." She found that: (a) presentation of assignments seldom included statements about the purpose of learning or relationships with other types of information; (b) teacher attention during seatwork was not directed toward monitoring understanding and accuracy but on maintaining a quiet, busy classroom atmosphere; (c) explanations of the assignment usually focused on the procedural elements of the task and neglected to cue the use of strategies such as checking; and (d) teacher feedback on seatwork focused on correctness and neatness rather than on explanations of processes leading to correct answers. Anderson reported that when low-achieving students did not understand the assignment they appeared to revert to an emphasis on inappropriate "getting-finished" strategies. Anderson contended that students may have been learning to equate success on seatwork with completion rather than with understanding.

It would seem that since students spend a large amount of time both in and out of school completing assignments, there would be a wealth of information related to assignment completion in the mainstream professional literature. However, relatively little research has been conducted on assignments in the content areas, and even less research has been completed on assignments and their effect on mildly handicapped and other low-achieving students. Lenz, Ehren, and Smiley (in press) argued that assignment completion is often the test of how independent a learner has become in an academic setting. They organized assignment completion into completion knowledge and completion management. Completion knowledge involves the academic skills and background knowledge required to actually get the assignment done. Completion management involves the planning, integration, and organization of time, interests, and resources that facilitate the use of academic skills and knowledge. Applied to the activation process, the teacher would need to take into consideration or predict the student's completion knowledge in an attempt to guide the student's skills in completion management.

Lenz, et. al. identified three basic types of assignments: (1) study, (2) daily work, and (3) project. *Study* assignments require the student to prepare for a test or some type of class activity. The focus of the assignment is usually on a process, not on a permanent product. *Daily work* consists of assignments that are routine followup activities of content covered in class. They are designed to promote practice and understanding of the content. Completion of chapter questions and worksheets are usually considered daily work assignments. Whereas many daily work assignments usually take a day or two to complete, they can sometimes take as long as a week. *Project* assignments require more than one or two days to complete and often require student extension or application of content in the form of a report, theme, visual, product, or presentation. All three assignment types can be completed in the classroom setting (seatwork) or

out of the classroom setting (homework) and can be completed individually or in a group, depending on the expectations of the teacher.

A number of studies related to assignments in the content areas have been completed with mildly handicapped and other low-achieving students. Many of these studies have focused on the effect of segmenting the content and prompting peer assistance to enhance learning. The effects of segmenting content was explored by Nagel, Schumaker, and Deshler (1986) who validated a first-letter mnemonic strategy intervention in which the students are taught a memorization strategy, but are also induced to segment the chapter into parts as part of a study assignment. Students are instructed in how to segment the book during class time, identify the to-be-memorized information, create mnemonics, and go through a series of self-test procedures to prepare for a test. While the focus of the intervention procedures was to teach the student to use specific memorization techniques, the manner in which the teacher required students to study using the strategy was found to be a key factor in promoting successful content learning. In another study related to segmenting content to enhance learning, Hughes, Hendrickson, and Hudson (1986) described a lecture-pause procedure in which the instructor paused for three to five minutes during a content lecture. During the "pause" in the lecture, students worked in groups in activities designed by the teacher to enhance learning. The process of grouping students was similar to the procedures described and implemented by Slavin, Leavey, and Madden (1982) in which heterogeneous groups of students work together cooperatively toward a common goal such as completing a worksheet or finding information in a text and agreeing upon the answers to a set of questions. In addition to studies on the value of segmenting content, many researchers have also explored models of cooperative learning (Johnson & Johnson, 1975; Slavin, 1983) and peer tutoring (Delquadri, Greenwood, Whorton, Carta, & Hall, 1986; Maheady, Sacca, & Harper, 1987).

Teaching Devices

A content enhancement device is an instructional procedure or tactic designed to achieve a singular goal in promoting learning and is associated with facilitating the understanding, remembering, and organization of information. A teaching device usually covers a very small segment of a lesson and is frequently embedded in a teaching routine. For example, within a routine designed to teach a broad concept, a device might be embedded in the routine to help students memorize a list of features salient to the concept. Therefore, the teaching devices can almost be conceptualized as instructional "tricks" used to enhance the learning of content.

The teaching devices are employed when specific elements of a lesson appear to present learning demands for the student that require more manipulation than the teacher predicts can effectively or efficiently be handled by the student. According to Schumaker, Deshler, and McKnight (in press) the Content Teaching Devices are used to: (a) make abstract information more concrete; (b) connect new knowledge with familiar knowledge; (c) enable students who cannot spell well to take useful notes; (d) highlight relationships and organizational structures within the information to be presented, and (e) draw unmotivated learner's attention to the information. There are three types of instructional devices: (a) devices for understanding; (b) devices for remembering; and (c) devices for organizing.

Devices for Understanding

Devices for understanding are specifically used to either make a complex or abstract concept more concrete for students or to link new information to something within the student's realm of experience or interest. Some devices for understanding have been explored by Schumaker et al. (in press) in terms of a wide range of verbal and visual devices designed to promote student understanding. These devices may be explored to enhance understanding of examples, comparisons, and cause-and-effect relationships. A further refinement may involve structuring the devices into specific areas representing concrete examples, verbal comparisons, or active demonstrations. These devices may be inserted at any point in a lesson where the teacher anticipates difficulty in understanding or when students have failed to respond to the presentation of some information.

Rationales for the development of specific devices for understanding come from educators such as Gagné (1985) who indicated that the acquisition of declarative knowledge occurs when new knowledge stimulates the activation of the student's prior knowledge. This leads to storing the new knowledge with the relevant prior knowledge. She suggested that some procedures that can be used by teachers to encourage elaboration include the use of analogies, instructions to the learners to form images, or instructions to generate elaborations. Many of the devices for understanding build on just such links to prior knowledge.

Devices for Remembering

Devices for remembering are techniques that teachers specifically use to guide students in how to memorize important pieces of information that may be part of a class presentation. These devices may consist of a variety of tactics including creating mental images, making familiar associations, or using keyword strategies. Devices for remembering can be inserted at any point in the lesson when the student is expected to memorize factual information.

Research on memory devices suggests that these can be powerful tools that teachers can use to help students remember certain types of information. Bellezza (1981) noted that mnemonic devices are learning strategies

that can often enhance the learning and later recall of information. He further noted that the basic distinction between various types of mnemonic devices is whether the purpose is to organize information or encode information. An organizing operation is one that associates or relates units of information that may appear to be unrelated. An encoding operation, on the other hand, transforms a unit of information into some other form so that it can fit into some organizational scheme.

According to Bellezza, mnemonic devices involve two types of organizational mnemonic devices and three types of encoding mnemonic devices. In the first category of organizational mnemonic devices, Bellezza lists the following: (1) "peg type" devices which are extrinsic cueing devices such as linking lists of items to locations in a sequential manner, linking items to mental images cued by a "peg-word," or remembering lists of items by using the first letter of each item to form another single word that cues memory; and (2) intrinsic cueing devices, referred to by Bellezza as "chain type" devices, include devices as story mnemonics, link mnemonics, and rhymes. In the second category, encoding mnemonic devices include: (a) concrete word encoding such as visual imagery; (b) abstract word encoding such as linking together words that have similar sounds or meanings; and (3) number encoding in which digits are changed into consonants to facilitate a memory pattern.

Several pieces of research support the use of various types of these mnemonic devices in the classroom. For example, Pressley, Levin, and McDaniel (1987) noted that if the teacher's objective is to maximize vocabulary remembering, then a mnemonic approach is an ideal instructional strategy because vocabulary-remembering research has proven mnemonic strategy instruction to be consistently superior to other strategies. They noted that no one strategy, of course, represents a single answer to all needs for facilitating vocabulary-learning objectives. Therefore, teacher and student alike benefit from a wide range of choices among memory devices which can be applied to differing content demands.

There is, indeed, a wide range of research directed toward facilitation of memorization. Various research has explored types of mnemonics such as the keyword device, rhymes, and first letter-mnemonics. For example, Mastropieri, Scruggs, Levin, Gaffney, and McLoone (1985) found that when learning disabled junior-high school students were taught definitions using a pictorial mnemonic strategy called the "keyword method," instruction was more effective than when students were taught definitions using direct instruction. This was true whether the teacher presented the mnemonic or students generated their own mnemonic images. Elliott and Gentile (1986) found that students who were taught the peg-word rhyme "one-bun, two-shoe . . . ten-hen" to remember how to associate numbers with images remembered facts about the to-be-remembered information significantly better than without the mnemonic. In a study involving the *FIRST-Letter Mnemonic Strategy*, Nagel, Schumaker, and Deshler (1986) indicated that students performed significantly better on both ability level and grade level material when the students were taught to memorize lists of information through a FIRST-letter mnemonic strategy. Students used a wide variety of mnemonic devices on grade level tests; mnemonic devices consisted of both single-word mnemonics and sentence or phrase mnemonics.

Devices for Organizing

Devices for organizing are techniques that teachers specifically use to make the organization of and relationships between information in a presentation explicit. These devices may include explicit use of lists, words to cue sequence or importance, use of graphic organizers, and study or lecture guides that are used as adjuncts to a class presentation. Devices to help the student organize information can be inserted throughout and at any point in the lesson when the structure of the lesson or the relationship between information needs to be drawn to the student's attention. These devices serve the same purpose as the advance and post organizer orientation routines discussed earlier. However, devices for organizing are inserted in the actual lesson. Therefore, once the organizing structure has been made explicit in the advance organizer, the organizer devices in the main part of the lesson serve to reinforce and guide the student's attention to the structure of the information. Study or lecture guides and graphic organizers serve a similar function. Therefore, the three primary types of devices for organizing include organizing: (a) cues; (b) guides; and (c) illustrators.

Devices for organizing may take the form of verbal cues, written study sheets to guide student understanding, or graphics designed to present information in an alternative manner to verbal lecture presentation. Verbal cues to facilitate acquisition of information from lecture have been presented by Robinson, Deshler, Denton, and Schumaker (in prep.). Study sheet adaptations and graphic organizers are two areas that teachers can employ to facilitate learning. For example, Lovitt, Rudsit, Jenkins, Pious, and Benedetti (1985) found that students with learning difficulties showed better performance on chapter tests when teachers supplemented the text with textbook adaptations such as vocabulary practice sheets and framed outlines than in a lecture-discussion format. Furthermore, Lovitt, Stein, and Rudsit (1985) introduced charts and diagrams with direct instruction and found that this combination led to improved scores on chapter tests. Similarly, the use of visual depictions has been shown to improve the performance of both students with and without learning disabilities on tests given after the teacher incorporated visual depictions in lecture presentations when compared to lectures presented without use of the visual enhancers (Crank, in prep.).

Teacher Planning

The challenge in developing routines to *improve teacher planning* based on an information-processing model for instruction requires the researcher to consider how the characteristics of information-processing oriented instruction can become part of the teacher's orientation to the teaching process. This requires that both the tangible and intangible aspects of the teaching and learning processes be considered. This approach to teaching also challenges educators to reconsider the notion that teachers effectively use information related to the characteristics of students to change their teaching behavior in order to promote student mastery of the stated curriculum. An alternate approach to teaching that is consistent with an information-processing orientation would be to view the teacher as a thinker responsible for potentially organizing situations for learning that promote effective and efficient information processing.

The use of an information-processing approach to study the role of the teacher in the teaching and learning process becomes more difficult as research attention shifts to focus on the performance of the student with learning disabilities. It is made more difficult because the focus of research is on judging the effects of the intervention based on changes in a small segment of the student population in the mainstream classroom. This places unique demands on the planning and teaching process. In essence, the teacher must be a good information processor to accomplish this task. A "Good Teacher Thinker Model" (depicted in Figure 5.2) has been proposed by Lenz, Bulgretz, Deshler, and Schumaker (in press) to serve as a conceptual framework for examining teacher thinking. This model is based on three principles. First, the teacher must have sufficient command of the subject matter and its organization. Therefore, the focus of teacher planning and thinking should be based on transforming, manipulating, organizing, and communicating information that is already part of the teacher's background knowledge rather than on teacher acquisition of knowledge (i.e., trying to learn the content that must be taught to students). Second, the teacher must have a repertoire of successful teaching routines that reduce the complexity of decision making and take into consideration the maximum amount of student variance in learning. These routines should focus on planning, content teaching, management, and strategy instruction, although other routines may also be useful and necessary. Third, the teacher should be encouraged and prompted to be a "good thinker" related to the integration of routines in the delivery of subject matter and in the spontaneous decision making required during the events of classroom instruction when the teaching-learning process breaks down. Figure 5.2 depicts a visual model of how these three elements might be associated in a simplified fashion. As shown, "Good Teacher Thinking" must take into account and is dependent on knowledge of teaching and management

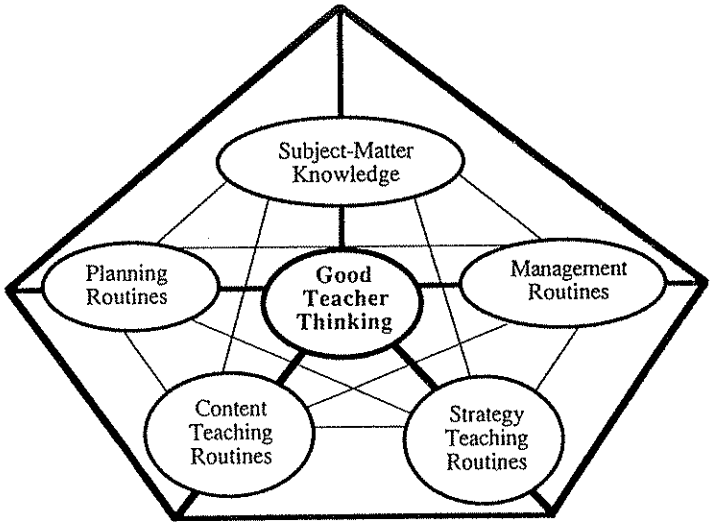

FIGURE 5.2. Good teacher thinker model.

routines; it must also take into account how these routines can be integrated so that student learning and performance is optimally enhanced.

Teacher planning is addressed in the Content Enhancement Model in two ways. First, each teaching routine specifies a specific planning process that is consistent across each of the routines. In general, the process includes: (a) specification of the to-be-learned content, (b) mapping of the critical features of the content, (c) analysis of prior-knowledge requirements, (d) decision making related to appropriate types and levels of content enhancement options, (e) delivery of the content using specific routines and devices through the enlistment of students as key agents in the teaching-learning process, (f) evaluation of the success of the instruction and the use of the routines and devices, and (e) evaluation of content potentially not yet learned. Second, the model incorporates specific routines for course, unit, and daily planning designed to focus teacher attention on the potential information processing characteristics of students in relation to the content that must be learned. Third, the implementation process will be grounded in the context of a teacher's personal development. Potentially, a Personal Development Strategy could be developed that could assist the regular education content teacher to identify what is personally gratifying about teaching and evaluate how student response to instruction affects their satisfaction and belief systems concerning teaching. This area of research has been initiated to address teacher motivations related to planning and teaching for individuals who potential-

ly comprise a small subset of the total instructional group. Research directed toward understanding a teacher's willingness to change may be the most critical factor in understanding and influencing the processes of planning and teaching for individuals with learning disabilities.

Ongoing and Future Research on Instructional Routines and Devices

Future research on the content-enhancement process will continue to focus on the development of planning and teaching procedures that can have a positive impact on the learning and performance of individuals with learning disabilities. In the area of teacher planning, future research efforts by the staff of the University of Kansas Institute for Research in Learning Disabilities will focus on how specific planning routines can affect content-area teachers' consideration of the information-processing characteristics of students before, during, and after direct contact with students. In addition, studies on the various levels of planning are currently being implemented. Future research on planning will focus on how teachers think about making modifications for individuals with learning disabilities and whether both general and specific routines for planning at the course, unit, chapter, and lesson levels can be successful.

The ongoing research on teaching routines will focus on the relationship between teaching routines and devices and will attempt to identify which of these have the most potential for promoting student success. An overview of current and future research efforts related to the development of those teaching routines that appear to have some potential for enhancing content acquisition is presented in Figure 5.3. The areas targeted for potential research have been generated from an analysis of the learning demands commonly placed on students in the content areas. For example, Explanation Routines may specify a set of instructional procedures that a teacher might use for successfully presenting objective information about a process, a series of events, a set of steps, a procedure, or a specific cause-and-effect relationship. In addition, it may be found that several routines may be required to enable the teacher to present specific information effectively and efficiently. An overview of current and potential research efforts related to teaching devices is presented in Figure 5.4. It is likely that these research areas will expand and be modified as the relationships between and among routines and devices become more clearly defined.

Model-Related Research Issues and Perspectives

The term "model' being used in this chapter is consistent with the conceptualization of "model' used by Wong (1988). According to Wong (1988), an intervention research model for learning disabilities should: (a) provide

Orientation Routines	Understanding Routines	Activation Routines
Current research areas Advance Organizer Routines (e.g. Lenz, Alley, & Schumaker, 1987) Chapter Survey Routines (e.g., Schumaker & McKnight, 1989)	***Current research areas*** Concept Teaching Routines (e.g., Bulgren, Schumaker, Deshler, 1988)	***Current research areas*** Assignment Completion Routines (e.g., Hudson, 1987)
Potential research areas Post Organizer Routines	***Potential research areas*** Analogical Anchoring Routines Explanation Routines Exploration Routines Case-making Routines Listing Routines Problem-Solution Routines	***Potential research areas*** Assignment Construction Routines Assignment Instruction Routines

FIGURE 5.3. Teaching routines potentially related to enhancing content acquisition.

	Current research areas	*Potential research areas*
Devices for Organizing	Verbal cues (e.g., Robinson, Deshler, Denton, & Schumaker, in prep) Illustrators/graphics (e.g. Crank, in prep)	Lecture/Study guides
Devices for Understanding	Verbal devices such as synonyms and analogies (e.g., Schumaker & McKnight, 1989)	Concrete devices such as manipulatives Active devices such as role play
Devices for Remembering	FIRST-Letter mnemonics (e.g., Nagel, Schumaker, & Deshler, 1986) Paired Associates (e.g., Bulgren & Schumaker, in prep.)	"Big Picture" Technique

FIGURE 5.4. Teaching devices potentially related to enhancing content acquisition.

a theoretical rationale related to how information-processing differences are addressed in the intervention, (b) be based on sound theory and prior research, and (c) utilize sound theory and prior research to identify powerful methods of instruction. Utilizing these basic assumptions as an umbrella, Wong has further argued that the model should include components that emphasize: (a) the acquisition of knowledge, (b) how students process and misprocess information, and (c) how motivation is or can be affected. While this chapter has attempted to demonstrate that these conditions have been considered in the development of this model, current and future research efforts are being planned with these assumptions and components in mind. In addition to these dimensions, Wong has identified a number of model-related issues that might be considered in the implementation of intervention research. These issues include: (a) distinguishing between content-specific strategies (e.g., obtaining history information from a history textbook), versus task-specific strategies (reading for important information from any textbook), (b) deciding how the comparison group for the validation effort is comprised, (c) distinguishing between teaching a strategy and teaching a student to be strategic, and (d) considering how strategy generalization and maintenance are ensured and measured. These represent very important issues in the validation process, and a few comments related to how these issues are related to the intervention research described in this chapter are necessary.

First, the teaching routines and devices have been conceptualized, proposed, and developed by examining the learning outcomes and processes involved in specific content domains. The completed and ongoing research has focused primarily on teacher implementation of the routines in the areas of science and social studies, and some exploratory research of the routines has been accomplished in the areas of language arts and mathematics. While there seems to be a demand for more frequent use of some routines in some areas, the same learning outcomes and processes appear to be prevalent across the domains. That is, the basic goals of the routines such as concept learning, understanding a process, remembering, understanding cause-and-effect relationships, taking and defending a position, etc. seem to be required across the disciplines, and the use of the routines in these areas appears to be an attractive instructional alternative for teachers. Simultaneously, there definitely are matching learning strategies for these same outcomes. Therefore, the potential exists for the teacher to be inducing strategic learning in an area while the student is attempting to acquire and apply more efficient and effective learning strategies in the same area. However, domain-specific instructional routines have not emerged. In fact, in the chapter reviews of the research on domain-specific teaching procedures included in Wittrock's *Handbook of Research on Teaching* (1986), a strong case for instructional uniqueness of the various content areas does not emerge. However, domain-specific learning strategies appear to be a possibility. For example, understanding and using "motive" as a way of interpreting world events or literary works might be considered a specific learning outcome unique to the areas of social studies and literature. However, the teaching routine for teaching students to evaluate "motive" in history events or stories is likely to be based on general procedures for teaching students about cause-and-effect relationships or teaching students how to understand and apply a process or procedure. While the power of teaching general learning strategies in the context of subject matter that must be immediately mastered by the student has been repeatedly demonstrated (e.g., Deshler & Schumaker, 1988; Lenz & Hughes, in press; Palinscar & Brown, 1984; Schumaker, Deshler, Alley, Warner, Clark, & Nolan, 1982), the relative power of instruction in potentially distinct domain specific learning strategies has yet to be determined. Clearly, further research must be conducted to determine the relationship between domain specific and task specific routines and and strategies.

Second, the initial studies in the development of specific content enhancement procedures have focused on: (1) whether teachers could learn to use the routine successfully (i.e., effectively and efficiently), (2) whether the content learning of students identified as learning disabled and who had repeatedly failed to learn and apply content could be improved, and (3) whether teachers and students have found the intervention to be socially valid and have continued to use the routine to promote learning. These

questions have been addressed by replicating multiple-baseline single-subject research designs pairing one or more students with learning disabilities with a teacher and then observing student learning and performance in relation to teacher implementation of the specific teaching routine or device. A variety of grade levels, ranging from seventh grade through twelfth grade across the content areas, have been involved in the research effort. In addition, peer comparisons on learning have been included in some of the studies.

While these studies have provided an enormous amount of information about the effectiveness of the intervention on individual students, current studies have been arranged to examine the learning and test performance of all students involved in each class. However, as Wong has suggested, it is still unclear as to whether the individuals identified as learning disabled are qualitatively different from other subjects in the way they process information. Such a distinction is important since the underlying construct of the model is based on the assumption that qualitative differences in the way that individuals with learning disabilities process information can be addressed through differentiated instruction. As a result, planning has begun for a series of experimental studies using both an approximate chronological age control group and an approximate reading age control group. The control groups have been labeled "approximate" because the range of reading in a regular fourth grade class varies. Fourth grade was selected because fourth grade reading performance appears to be a minimum criterion for success in secondary content area classes. The application of this approach to the problem should functionally address the problem of discerning the uniqueness of the sample of individuals with learning disabilities within the context of regular classroom research. In addition, if qualitative differences are not observed, the intervention research can continue, but as line of intervention research with a broader intervention mission.

Third, Wong has argued that intervention research efforts should distinguish between teaching a strategy and promoting strategic behavior. Rightly, many researchers have argued that a great deal of strategy instruction taking place over a long period of time is required to teach a student how to be strategic (e.g., Pressley, Goodchild, Fleet, Zajchowski, & Evans, 1989; Wong, 1988; Deshler & Schumaker, 1988). However, the development of strategic problem solvers also rests on the degree to which agents in the total educational environment cue, prompt, model, demand, and reinforce strategic performance. That is, long-term programmatic efforts in strategy instruction should also enlist the support of key agents in settings in which strategic performance is required. As a result, while it cannot be said that the Content Enhancement Model induces strategic problem solving, it can be said that the development of strategic problem solvers is a goal of this model and measures should be taken to make this a part of the long-term evaluation of its success.

Fourth, the important role of generalization in intervention research has been discussed by a number of authors (Ellis, Lenz, & Sabornie, 1987; Pressley, Woloshyn, Lysynchuk, Martin, Wood, & Willoughby, in press; Wong, 1988). However, most of the generalization related research has focused on whether students can learn a strategy or a skill and then generalize its use to specific situations outside of the training setting. To accomplish this, researchers have proposed various paradigms for promoting strategy generalization and maintenance (e.g., Wong, 1985 and 1988; Ellis, Deshler, Lenz, Schumaker, & Clark, in press). However, how knowledge transfer and generalization in the content areas are accomplished is another area worthy of research attention. While research in cognitive psychology and reading has focused attention on flexibility and transfer in the content domains (e.g., Spiro, Vispoel, Schmitz, Samarapungavan, & Boerger, 1987), few researchers in the field of special education have considered the problem presented by the types of generalization involved in the nonskill areas of content learning for individuals with learning disabilities. That is, can students take information learned in science and or history class and apply this information in new situations and integrate it with new information when appropriate? While generalization of learning strategies to content learning situations is certainly a goal of the content enhancement model, the identification of content knowledge and then the automatic retrieval and use of this information as background knowledge to draw appropriate relationships to solve problems is the logical extension of the strategy generalization process.

Conclusion

As a conclusion to this chapter, it is important to discuss two key points about the Content Enhancement Model and its development. First, the constructs discussed in this chapter are the focus of a series of research studies that is part of a programmatic research effort and fits within a comprehensive set of research efforts involved in the development of the Strategies Intervention Model (Deshler & Schumaker, 1988). The key components of the Content Enhancement Model have evolved from the findings and observations of many completed and ongoing studies. In addition, future studies will probably alter the model and the relationships described here. Therefore, it is unwise to interpret this model as fixed, and it should be viewed as one proposal for thinking about content-area instruction for individuals with learning disabilities. As a result, it can be viewed as both a conceptual and a development model. Second, while the interpretation and application of information-processing theory has played a critical role in the development process, it has always served as a rather broad umbrella for development decisions and has been subject to interpretation in light of successful practice. Therefore, if there is a debate as to

the role of theory in intervention research, it may be that the debate rests on how theory and how much of theory can be translated into effective and efficient practice. This is an important consideration because some lines of intervention research that have proven to be effective and have had a powerful impact on performance have not yet met the test of efficiency and replicability in practice. Thus, on one hand, we might agree with Kurt Lewin's (1935) suggestion that there may be nothing more interesting than practice that emerges from good theory. On the other hand, we may prefer to endorse Walter Doyle's (1989) suggestion that there is nothing more theoretically interesting than good practice.

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