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ABSTRACT

The report examines key questions surrounding cognitive and metacognitive strategy instruction for disabled learners as a concept and in practice. The first three sections provide background information about cognitive and metacognitive strategies by defining terms, by discussing their relevance to special education populations, and by summarizing research. Section 4 illustrates how strategy instruction might be applied by highlighting three varied approaches that have been used with children with learning problems. Sections 5, 6, and 7 address issues that directly relate to implementing strategy teaching in the classroom. Section 5 discusses program components that are characteristic of successful strategy interventions, Section 6 focuses on the pivotal role of the teacher, and Section 7 discusses how media and materials can help teachers teach and students learn strategies. Appended are a sample record from the Information Center for Special Education Media and Materials database and an extensive bibliography. (DB)

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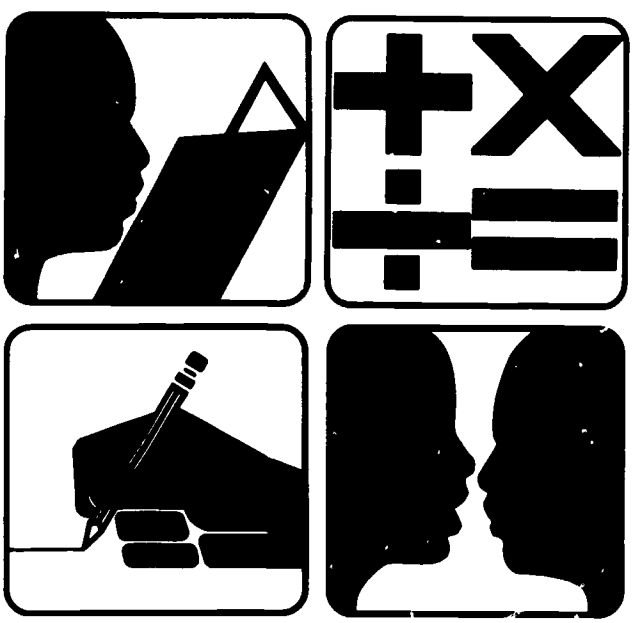
Cognitive and Metacognitive Learning Strategies-- Their Role in the Instruction of Special Education Students



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Cognitive and Metacognitive Learning Strategies-- Their Role in the Instruction of Special Education Students

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PREFACE

The Information Center for Special Education Media and Materials is a project of the United States Department of Education's Office of Special Education Programs. Housed at LINC Resources in Columbus, Ohio, the Center's mission is to increase the quality, availability and use of special education media and materials. Specifically, the Center hopes 1) to increase the quantity of media and materials that are designed according to instructional principles that have proved to be effective with special education populations and 2) to identify ways in which these and other media and materials can best be used to further learning opportunities for handicapped children.

We know that 90% or more of a student's classroom time is spent with media and materials, yet such materials are but one component of the instructional process. Learner characteristics, expected outcomes, teacher effectiveness, administrative support, the learning environment, educational philosophy, and instructional methods also contribute to positive or negative educational experiences. Clearly, any meaningful effort to improve media and materials must take place within the larger context of improvement of instruction. Therefore, the Center must pursue its goal by identifying instructional methods that are effective with special education populations, investigating the factors that make these methods work in the classroom, and specifying the roles which media and materials can play to facilitate the instruction of these methods.

The Center's role, then, is to provide leadership in these endeavors. It does so by focusing the attention of practitioners, publishers, and researchers on the major issues and questions related to improving the design and use of media and materials. Annually, the Center convenes members of the research, school, and publishing communities to think actively together, addressing identified issues and questions. We at the Center believe that it is only through reliance on the wisdom and realities of all three communities that we can hope to encourage refinement of promising methods, accelerate the incorporation of proved principles into instructional products, and foster the appropriate and effective use of these methods by classroom teachers.

CONTENTS

INTRODUCTION

Can students with learning problems be taught to be more effective, efficient, active, and independent learners? This fundamental question is at the heart of a significant body of recent educational research, that involving the investigation of the impact on children's learning of cognitive and metacognitive strategy instruction. Research results point to the potential benefits of cognitive and metacognitive strategy techniques for educating students with learning difficulties. As a result numerous instructional approaches have been designed and developed for the purpose of helping students with learning problems become more effective, efficient, and independent learners. Examples of some of these approaches include The Strategies Intervention Model, Reciprocal Teaching, the Direct Explanation Model, Self-Instructional Strategy Training, and Informed Strategies for Learning.

Without question, special educators throughout the country--at the district, building, and classroom levels--will be giving increasing attention to strategy instruction and will be attempting to make decisions about its appropriateness for use with their special education students. This report is intended to assist them in that effort by summarizing some of the key data about and issues surrounding strategy teaching.

This past year the Information Center for Special Education Media and Materials, a five year project funded by the U.S. Department of Education's Office of Special Education Programs, has examined the research and realities of cognitive and metacognitive learning strategy instruction. This examination has occurred in two ways--through the review of research studies and the sponsorship of an invited forum. The Instructional Methods Forum, held in Washington, D.C. in August, 1988, was attended by a select group of researchers, practitioners, and publishers with experience in the strategy instruction area. The intent of the Forum was to engage these three groups in discussions of general issues surrounding the classroom use of strategy approaches with special education populations. In addition, a specific focus was the role media and materials could play in this area.

The Forum served to raise and address those questions that would be asked by educators trying to understand the nature and philosophy of strategy instruction and the factors that are involved in successfully applying these techniques to instruct special education students in the resource room or regular classroom. Such fundamental questions include the following: Do learning strategy approaches really work with handicapped students? How could those students instructed in strategy use be expected to change their approach to learning? What components or characteristics of strategy instructional programs seem to work best? What is required of the teacher, and how could he or she best be trained, in using these instructional approaches? Do media and materials have a role in helping to instruct students and teachers in strategy use, and if so, how can that role be enhanced?

Clearly, these questions have no simple answers. Discussion of them by individuals who have devoted considerable attention to researching, teaching, and/or publishing strategies have produced

illuminating and sometimes divergent opinions and insights. We believe that consideration of these opinions and insights by educators will lead to more informed, realistic decision-making and more effective instruction for special education students.

This report, then, provides summary discussions of the key questions surrounding cognitive and metacognitive strategy instruction as a concept and in practice. The first three sections provide background information about cognitive and metacognitive strategies by defining terms, by discussing their relevance to special education populations, and by summarizing research. Section Four illustrates how strategy instruction might be applied by highlighting three varied approaches that have been used with children with learning problems. Sections Five, Six and Seven address issues that directly relate to implementing strategy teaching in the classroom: Section Five discusses program components that are characteristic of successful strategy interventions, Section Six focuses on the pivotal role of the teacher, and Section Sever discusses how media and materials can help teachers teach and students learn strategies.

It is hoped that the contents of this report will provide decision makers at the classroom, school, or district level with a more thorough understanding of the complexities yet potential rewards of quality strategy instruction.

SECTION ONE

Cognitive and Metacognitive Learning Strategies: What are They?

Before examining some of the key questions about cognitive and metacognitive strategy instruction, terminology must be confronted. For some, the terms "cognitive" and "metacognitive" conjure up images of elusive and esoteric philosophies. Educators need to be assured that while the theories upon which cognitive and metacognitive strategy instruction are based are not simplistic, they are quite understandable and practical.

Working Definitions

Definitions of these terms abound, and the various definitions reflect different theories and philosophical beliefs of what learning strategies could or should be. In the research arena, where it is crucial to have common agreement on what is being studied so results may be compared from study to study, definitional precision has a high priority. But it has less relevance in the school environment where the major concern is the implementation of instructional methods that will help students to learn. Thus, school professionals need a general understanding of these terms so they may judge the relevance and applicability of these instructional approaches for their students.

For the purpose of this discussion, *cognitive learning strategies* refers to those techniques, procedures or processes that students apply in learning situations to help them acquire, store or express information more effectively. In a sense, strategies empower students by arming them with techniques that facilitate learning. For example, reading strategies such as paraphrasing and summarizing help students acquire important information from the written word; listening strategies such as notetaking help students enhance their abilities to glean important information from lectures; memory strategies such as first-letter mnemonics help students learn and retain facts. The strategies are intended to help students to learn, to solve problems, and to complete tasks independently (Deshler & Schumaker, 1986).

However, as Annemarie Palincsar (1986b) points out, knowing strategies alone is not enough to insure effective and appropriate use of them. Something more is required, and that something is metacognition. *Metacognition* has been defined by Baker and Brown (1984) as an awareness of the skills, strategies, and resources that are needed to perform a task *and* the ability to use self-regulatory mechanisms to successfully complete the task.

As the above definition indicates, metacognition generally is thought to have two components. The first relates to an individual's abilities to assess the demands of the task at hand and also to understand his or her own strengths and weaknesses in relationship to the task (Reeve & Brown, 1985). As an example of metacognitive knowledge at work, an adult about to read income tax form directions realizes that this task, while important, will not be particularly entertaining. A person who has had previous experience with tax forms also will know that the reading task will be demanding, requiring considerable concentration. This knowledge will

probably lead to decisions about when, where and how to read the directions.

The second component of metacognition is concerned with regulating the performance of a task. In learning situations, this form of metacognition involves applying a variety of processes that, in information processing parlance, are often referred to as "executive" functions: they include planning, monitoring, and evaluating the learning process (Baker & Brown, 1984). To illustrate, the individual in the example above, after reading a section of the tax form directions, may ask, "Did I understand that?" An effective learner who answers "No" will take some corrective action, such as rereading the section or reading ahead to see if further information provides clarification.

"...effective learning requires the coordinated application of both cognitive and metacognitive processes."

Effective learners routinely and often unconsciously use their metacognitive capacities as they select cognitive strategies they think will work in a learning situation, apply the strategies, monitor their use, evaluate their effectiveness, and make adjustments as necessary. For effective learning to occur, cognitive and metacognitive strategies need be used in concert.

Palincsar (1986b) uses a football metaphor to illustrate this working relationship between cognitive and metacognitive strategies. During a football game, a team runs an array of offensive plays to acquire yards or points; some plays involve passing, some running, some kicking. These plays are analogous to cognitive strategies: the former are intended to help the team acquire yards or points, while the latter help the learner acquire information.

In a game situation, a team does not run these plays at random. Rather, metacognitive knowledge and executive control are involved in play selection. Teams usually have a game plan generated prior to the game that reflects the coaching staff's pre-game assessment of the strengths and weaknesses of its own and the opposing team, along with other factors that could affect play, such as weather conditions and stadium characteristics.

While the plan reflects the best thinking of the coaching staff prior to the game, it is understood that deviations from it could be necessary. During the game, therefore, coaches monitor the implementation of the game plan, evaluate its effectiveness (i.e., determine if they have scored enough points), and make adjustments in play selection as necessary. Ultimately, a team's success depends not just on skilled execution of individual plays (cognitive skills) but on the appropriate selection of those plays (metacognitive skills). Effective learners, then, function like effective football teams: They have an array of good strategies at their command, they are skilled in the strategies' use, they know when to apply them, and they can assess a strategy's usefulness or success as they "play."

Educators need be aware that there is some debate over what is cognitive and what is metacognitive, and indeed, the distinction between cognitive and metacognitive strategies is often blurred. For example, in reading, summarization is used to acquire information (a cognitive strategy), but summarization also can be thought of as a monitoring technique (metacognitive strategy) applied by the reader to determine if he or she understood what was read (Palincsar, 1986b). Being able to classify a strategy as cognitive or metacognitive should not be a major concern for the practitioner. In many writings related to learning strategies, reference to cognition or metacognition has been dropped, as it will be for most of this report. What is important to understand is that effective learning requires the coordinated application of both cognitive and metacognitive processes.

Relevance to Instruction

The theories of cognition and metacognition have naturally led to questions about their relevance to instruction, i.e., Can students, particularly students with learning problems, be taught strategies to help them to become more efficient, thoughtful, independent and reflective learners? In the past few years, several instructional approaches have been developed with the aim of achieving these goals through the teaching of learning strategies. While the usefulness of this type of instruction is not confined to students with special learning needs, it holds particular promise for those children since it addresses learning deficiencies often observed in special education populations.

Specific strategy instruction approaches have been developed and used with children from elementary to high school levels. Sometimes these programs are designed to teach students strategies

as a part of their instruction within a specific subject area such as reading or writing, and sometimes instruction is taught as a separate process, to be applied later by the student in subject-matter courses. Various approaches are designed for use with children individually, with small groups, with the total class, in resource rooms, or in regular classrooms.

It is important to stress that the instructional approaches that are referred to in this report emphasize the interrelationship of cognitive and metacognitive processes; they aim to teach students effective learning techniques *and* why, when, and how to use them. These approaches do differ, however, in the methods they utilize and in their immediate goals. Some strategy instruction approaches are specifically designed to help failing students improve their grades or pass a statewide proficiency tests, while other approaches concentrate from the onset on the development of reasoning and thinking processes. These outcomes are not mutually exclusive, but they do reflect real differences in the philosophies and expected results.

Educators need to know the intended outcomes of a given instructional approach so that they may match their goals with those of the approaches they select or develop. But it would truly be unfortunate if educators only looked to their immediate needs when considering how strategy instruction could help their students. Indeed, much of the work in this area directly or indirectly challenges educators to raise questions about the worth of current learning outcomes. Therefore, review of strategy instructional methods could serve as an opportunity for educators to reflect on their goals and expectations for all students, including those who are handicapped.

Most developers of strategy approaches also would agree that this method of instruction should not be treated as a quick fix or a temporary add-on to the current curriculum. Nor is it intended to supplant other valid educational methods or curricular offerings. Rather, strategy instruction is intended to be used in harmony with other methods, to enrich the curriculum as a whole. To achieve this ultimate goal requires that strategy teaching become a natural and integral part of the curriculum and instruction.

"...this method...should not be treated as a quick fix or temporary add on to the current curriculum."

But while researchers and developers of these approaches hold these high goals, they realistically caution that as a remedial technique, strategy instruction will not necessarily work for all children. Some children's problems will not be amenable to correction by this method, while other children will lack the prerequisite knowledge and skills needed for them to benefit from the teaching of strategic approaches to learning. Yet for many special-needs students, strategy instruction holds the potential for increasing learning effectiveness. The next section addresses why this may be so.

SECTION TWO

Why Does Learning Strategy Instruction Hold Promise for Students with Learning Problems?

Learning strategy instruction has caught the attention of special educators for the reason that it addresses some of the observed learning deficiencies of many special education students. These students usually are ineffective learners, and the main goal of strategy instruction is to increase learner effectiveness by teaching processes that will enable students to become more independent learners.

Characteristics of Effective and Ineffective Learners

Those who have developed strategy instruction interventions are quite cognizant of research findings showing significant differences between effective and ineffective learners' approaches to learning. For example, effective learners frequently develop and use an array of learning strategies without being specifically instructed to do so. With age and experience, children who do not have learning problems seem to infer techniques that help them learn better (Brown et al., 1983). Many of these students have observed these strategies being modeled by their parents, teachers and other adults. These learned techniques may not be the most sophisticated or efficient, but it is clear that students, through their experiences, develop a basic knowledge of learning procedures or strategies that work for them (Pressley, et al, in press-b).

The same cannot be said for children with learning problems. Studies have indicated, for example, that learning disabled students tend not to infer or to develop naturally the array of strategic behaviors observed in more effective learners (Englert et al., 1988, Bos & Fillip, 1984; Wong & Jones, 1982).

Effects of Strategy Differences on Learning

How is this lack of strategic behavior exhibited in school work? One example can be seen in the area of reading. Ineffective learners generally are poor readers. They do not consciously monitor their understanding of what they read, they frequently are not aware of the purpose of reading, they do not adjust their reading rates to match the demands of the reading task at hand, they have difficulty relating their past experiences to what they have read, and they do not use context to construct representation of text (Baker & Brown, 1984; Paris & Myers, 1981; Wong & Jones,1982). These students show little evidence of skimming, looking back, or employing strategies to remedy problems even when they have detected them. Too, poorer readers frequently seem to be unaware that they must extend efforts beyond decoding to make sense of what they read (Brown, 1985; Brown & Campione, 1986).

Oka and Paris (1987) point out that besides ineffective use of appropriate strategies and lack of understanding about how to plan, evaluate, and regulate learning, poor readers also have negative attitudes about reading, negative perceptions of

their abilities, and a lack of intrinsic motivation.

This portrait of poor readers contrasts sharply with that of proficient ones. Good readers plan their reading approach; they apply strategies to foster learning, such as clarifying the purpose and identifying parts of the message that are important; they allocate their attention so that they can concentrate and focus on the major content; they monitor their comprehension by engaging in review and self-questioning; they take corrective action when they fail to comprehend; and they recover from distractions (Brown, 1980; Baker & Brown, 1984; Duffy et al., 1987c; Luftig & Johnson, 1980). In other words, they consciously and appropriately apply an array of reading strategies to help them construct meaning from text.

Writing is another area in which the contrast between good and poor performers is evident. Good writers are characterized by their knowledge and use of strategies for planning, drafting, editing and revising text materials (Flower & Hayes, 1981). Furthermore, they understand how text is usually put together (text structure) and design their products accordingly (Meyer, 1975). Englert and Raphael (1988) state that the knowledge that writing is usually organized in different ways to serve different purposes is used by good writers to help them make decisions about how to group, combine, and order ideas to produce meaningful text: in other words, good writers know how to regulate the writing process. Not surprisingly, special education students--specifically, learning disabled students--have been found deficient in regulating this process (Graham & Harris, in press; Englert et al., 1988).

Strategic Learning Behavior and Special Education Students

As a general statement, then, efficient learners are good strategy users. They exhibit knowledge of strategic procedures, an understanding of why these strategies work, and an awareness of when and how strategies are most appropriately applied (Pressley & Levin, 1987; Pressley, 1986; Jones et al., 1987; Pressley et al., in press-a).

Conversely, poor learners, including many special education students, often are strategy-deficient. For example:

- Learning disabled children commonly experience problems in writing (Graham & Harris, in press; Englert et al., 1988) and reading (Oka & Paris, 1987). These deficiencies can be traced to a lack of understanding of the purpose of the academic tasks and lack of strategic behavior when engaged in those tasks (Wong & Wilson, 1984; Englert et al., 1988).
- The reading problems of many hearing impaired children, according to Erickson (1987), stem from several sources: lack of world knowledge, lack of linguistic proficiency, and lack of knowledge about metacognitive strategies. As a result of the last deficiency, deaf children often do not understand the meaning of reading.
- Borkowski (Borkowski et al., 1986) has noted that while wide differences exist in strategy behavior among mentally retarded students, and some retarded students are capable of developing strategic behavior on their own without being instructed to do so (Kellas et al., 1973), generally, mentally retarded students lack effective learning strategies and self-management skills (Borkowski & Cavanaugh, 1979; Brown, 1974).

Researchers, continuing to debate the question of why learning strategy deficiencies are so evident among special education populations, have offered a number of explanations. For example, some have theorized that the lack of strategy proficiency in reading among learning disabled children can be traced to their deficiencies at word recognition and decoding. When students struggle at this level, they fail to develop efficient strategies that would assist them in higher-level skills such as those used for reading comprehension (Kolligian & Sternberg, 1987). According to these theories, many learning disabled children's reading comprehension problems develop because early reading failure deprives them of opportunities to learn and become skilled as strategy users (Spear & Sternberg, 1987; Samuels, 1987). Because of their failure to automatize, these students, when reading, must devote most of their mental resources to lower-level skills such as decoding; as a result, little of their "working memory" is available for use for higher-order skills.

"...poor learners...often are strategy-deficient."

Some researchers, while acknowledging that poor decoding skills and poor comprehension are related, do not believe that lack of decoding skills is the cause of later comprehension difficulties. Rather, they believe both deficiencies are the result of poor language abilities, which, it is believed, are evident

in these youngsters even at the preschool level (Ceci & Baker, 1987).

These various theories of why learning disabled children often are found to be strategy-deficient are mentioned here to stress an important point. Ideally, a remedial approach should be selected because of its potential for remedying the known cause of the learning problem. But when the cause of a problem cannot be definitively identified or when there are multiple causes, application of any intervention implies risk. That is, success is not guaranteed.

In the area of special education in general and learning disabilities in particular, much uncertainty exists about causes of learning problems and appropriate solutions. Too, within categories of handicapped students, considerable differences exist from one child to another. Those attempting to teach strategies as a remedial intervention should be cognizant of the need to differentiate among students who may and may not benefit from strategy instruction in general or a given strategy in particular.

One other potential benefit of this instructional method should be noted before leaving this section. Thus far, most discussion of the usefulness of strategy instruction for special education populations has centered on its potential for improving academic performance, but motivation of these students may also be positively affected. Learning disabled students, for example, have been frequently characterized as less motivated than their non-learning disabled peers (Schumaker & Hazel, 1984), and as passive and inactive learners who believe that they do not have control over their learning (Ryan et al., 1986). Strategy instruction, with its emphasis on making students active participants in the learning process and equipping them with learning techniques to help them succeed where once they failed, may address these needs in learning disabled students and other special education populations as well.

The learning strategy deficiencies of special education students are well documented. Special educators searching for more effective ways of remediating their students' learning problems naturally are curious about approaches and programs that purport to address some of the learning and motivational needs evidenced in special education students. So the question that needs be asked is, "Has research shown that these methods do in fact work with special education students?" The next section will address this question.

SECTION THREE

Research: What It Shows

Can special education students be taught strategies? If so, do these students use the strategies in their school work, and with what results? Several studies have been conducted over the last few years to attempt to answer these questions. The intent of this section is to summarize the findings from an ever increasing number of investigations that reveal the potential benefit of strategy instruction for students with learning problems.

Before doing so, it is important to stress that studies in this area do not constitute a cohesive body of research. Different researchers have worked from different definitional and philosophical bases. Their studies have employed a variety of designs, tested a variety of strategies and approaches, and involved a variety of subjects and students. Therefore, the generalizations presented in this section in answer to the above questions should not be assumed to apply to all research of strategy approaches.

It should be remembered also, as mentioned throughout this report, that strategy instruction does not benefit all students in all circumstances. For example, some youngsters may not possess the necessary prerequisites to profit from these approaches to learning, while other young people, particularly more able learners, may already effectively apply learning strategies. Too, within groups, classes or categories individual students vary widely in their skills and capabilities. Currently, as Michael Pressley and his colleagues (Pressley et al., in press--a) have pointed out, little is known about how such individual differences may be used to predict which students may most benefit from strategy instruction.

What *is* known from research is that many students with learning problems are capable of learning and using learning strategies. The degree of success noted for any one student will depend on factors such as the nature and severity of the student's handicap, the age of the student, the strategies taught, and the approach used.

Studies of Special Education Students

Among handicapped students, learning disabled children at both the elementary and secondary levels have most frequently been the target for research of strategy learning and use. Results of numerous studies lead to the general conclusion that learning disabled students at both school levels can be successfully taught to use strategies (Wong, 1986a; Palincsar & Brown, 1986; Clark et al., 1984; Wong & Jones, 1982; Wong & Wilson, 1984; Chan et al., 1987; Chan & Cole, 1986; Schumaker et al., 1982; Schmidt, 1984; Reid & Torkowski, 1985; Brown & Palincsar, 1987; Harris & Graham, 1985; Harris et al., 1988). While fewer studies have been conducted on mentally retarded students, results of some of these investigations provide evidence that these students, too, can be taught to use strategies (Campione & Brown, 1977; Kendall et al., 1980).

Although research indicates that handicapped children can be taught strategies, do such students apply what they have learned appropriately and independently? Fewer studies have examined this

generalization issue, but some do show that learning disabled students have successfully generalized reading and writing strategies. Research has revealed that generalization is enhanced when, as a part of the training process, students are informed of the purpose of the strategy and of ways in which it could be used outside the training environment (Schumaker et al., 1982; Schmidt, 1984; Brown & Palincsar, 1987; Harris & Graham, 1985).

Studies have revealed that mentally retarded students have more of a problem maintaining and transferring learned strategies (Gardner, 1985; Campione & Brown, 1977). Researchers have theorized that the reason for the failure of these students to apply taught strategies may be that they were not specifically informed as to why the strategies might be useful or helpful. (Campione & Brown, 1977). This position is supported by studies showing that maintenance and transfer of skills among retarded students is enhanced when these students are taught why the strategy is effective and are given the opportunity to practice it in multiple settings (Belmont et al., 1978; Kendall et al., 1980).

Other studies suggest that the mental age of the student plays a key role in generalization. Those students with higher mental ages may be more likely to transfer use of strategies than students with lower mental ages (Brown & Barclay, 1976; Brown et al., 1979).

"...many students with learning problems are capable of learning and using learning strategies."

Finally, special educators need to ask, "If students can be taught to use strategies and they do so in appropriate post-training situations, do the strategies make a difference in the overall learning abilities and academic performances of these students?" As might be expected, even fewer studies have addressed that question. But once again, notable positive results can be cited. As examples:

- The Learning Strategies Curriculum program, developed at the Institute for the Study of Learning Disabilities at the University of Kansas, focuses on teaching adolescent learning disabled students an array of strategies aimed at improving these students' reading, listening, and writing skills. This approach reportedly has been successful in raising students' grades in regular classroom settings (Schumaker et al., 1982; Schmidt, 1984).
- The Reciprocal Teaching approach, developed by Palincsar and Brown, has succeeded in improving students' scores on the Gates-McGinitie standardized reading comprehension tests (Brown & Palincsar, 1987);
- The Direct Explanation approach developed by Duffy, Roehler, and others has been successful in significantly improving students' scores on the word-study subtest of the Stanford Achievement Test (Duffy et al., 1987c). More details about each of these approaches appears in the next section.

In conclusion, research results point to the potential benefits of strategy instruction. It is important to remember, though, that results vary from approach to approach. An educator interested in a specific approach would be wise to analyze studies of its effectiveness with special education students.

Effective Strategies

Educators, in addition, should examine the actual strategies that are taught within the approach. Researchers such as Michael Pressley point out that while many strategies have been proposed for instructional application, few have been adequately evaluated to date, individually or within programs. And some strategies that have been evaluated have been shown not to make a difference in student performance.

Pressley and his colleagues (Pressley et al., in press-b) analyzed reading strategy research involving students between the third and eighth grades. Only research that included a comparison or control group was examined. As a result of their evaluation, Pressley and his colleagues identified six strategies that have been proven in controlled experiments to help children remember and comprehend what is read. Those strategies are the following: summarization, imagery, story-grammar, question generation, question answering, and prior knowledge activation.

It is important to remember that Pressley's review was not confined to special education applications; furthermore, it only involved memory and comprehension strategies related to reading instruction targeted to third through eighth graders. Future research may prove other strategies effective as well. Yet these findings underscore the

importance for school personnel to go beyond the superficial and to ask hard questions about the effectiveness of the approach with students for whom it is intended to be used.

But the educator should not stop there. For as valuable as research findings are in describing the effectiveness of a given approach in a study situation, they obviously do not tell the whole story. The opinions, observations and insights from teachers who have taught strategies should be sought and considered. (Note: The listing of ICSEMM 1988 Instructional Methods Forum participants in Appendix A contains the names of several school-based practitioners who have been involved with specific strategy instruction approaches.)

To this point, we have discussed the theories behind strategy instruction, why this approach may have applicability to special education populations, and some research findings suggesting the potential usefulness of these methods for instructing special education students. The next section of this report is intended to give educators a more in-depth look at strategy instruction by providing descriptions of three different approaches that have been developed and used with students experiencing learning problems.

SECTION FOUR

Approaches to Cognitive and Metacognitive Strategy Instruction: Three Examples

Numerous approaches for teaching cognitive and metacognitive strategies to children with learning problems have been developed and tried. As mentioned earlier, these approaches vary in the techniques applied, students involved, subjects addressed and strategies taught. But all of these interventions are based upon these assumptions: inefficient learning behavior is modifiable, at least to some extent; for some strategy-deficient special education students, strategy instruction is an avenue leading to more effective and efficient learning; and once armed with learning strategies, students who have experienced learning problems will be more active, thoughtful, and confident learners. It is hoped, then, that these examples will provide the educator with a better understanding of what strategy instruction is, when it may be appropriate to use, and what might be involved in its classroom application.

In this section, three approaches to learning strategy instruction will be described to illustrate the diversity of existing strategy instruction interventions. Each of these approaches focuses at least in part on the improvement of reading comprehension. This selection was intentional. In the strategy instruction realm, the area of reading seems to be best explored. By focusing on approaches that have similar aims, the differences in the methods used will become more obvious.

Reciprocal Teaching: Learning through Dialogues

Reciprocal Teaching, an interactive teaching approach, is based upon theories that social interactions play a prominent role in the learning process (Brown et al., 1983; Palincsar & Brown, 1988). Developed by Annemarie Palincsar and Ann Brown, Reciprocal Teaching is intended to improve the student's reading comprehension by teaching four strategies: summarizing the main content of what has been read, formulating potential test questions, clarifying ambiguities, and predicting what may come next (Palincsar, 1986b; Palincsar & Brown, 1984; Brown & Palincsar, 1987). These strategies are typically used by expert readers, while slow-learning children and new readers seldom employ them (Brown & Palincsar, 1987). The ultimate goal of Reciprocal Teaching is to influence how students interact with the learning situation. It aims not just to remediate an immediate educational deficiency but also to enhance students' problem-solving abilities (Palincsar, 1986b; Brown & Palincsar, 1987).

Strategies are taught to students through a series of dialogues between the teacher and students, with the dialogues centered on sections of text that students have first read silently. The teacher may begin by asking a student to summarize the passage that has just been read. After the first student responds, other students may refine, shorten or restate the answer. Next, a student may be asked by the teacher to think of a question that could be asked about the information in the passage. After a student responds, other students may again join in by refining the question.

Throughout this process, students may seek clarification of words or concepts they do not understand. The teacher may lead students to discover word-meanings or prompt them to apply

previously-learned strategies for gaining clarification (e.g., using context for identifying the meaning of unfamiliar words). Finally, students will be asked to think ahead and predict what information will follow in the next passage (Palincsar, 1986b).

Palincsar and Brown have published several sample dialogues. Review of these proves to be very enlightening and is highly recommended (for example, see Palincsar & Brown, 1988; Brown & Palincsar, 1987; Palincsar & Brown, 1984).

Instructional principles. Several important instructional principles underlie this instructional approach. The teacher informs students of the purpose and usefulness of the strategies to be taught, defines the strategies, and identifies situations in which the strategies could be applied. As mentioned earlier, knowledge of why the strategy is important and how it may be used has been shown to be related to students' use of the strategy beyond the training situation.

"The ultimate goal of Reciprocal Teaching is to influence how students interact with the learning situation."

Teacher-modeling of the use of the strategies in appropriate contexts is another feature of Reciprocal Teaching. Modeling is intended to make explicit and concrete the ways in which students can use strategies to monitor their learning (Palincsar & Brown, 1988; Brown & Palincsar, 1987). The teacher's role changes, as instruction progresses, from that of mediator/facilitator to reflector/coach. In other words, when instruction using the Reciprocal Teaching approach begins, the teacher acts as the discussion leader. But through this interactive process, students gradually acquire proficiency in strategy use; over time, teacher involvement fades, and control of the discussions passes to the students (Brown & Palincsar, 1987; Palincsar & Brown, 1986). Too, throughout the period of instruction, appropriate feedback and encouragement is provided to students (Brown & Palincsar, 1987; Brown, 1985).

Ideally, this approach is for small groups of six to eight students; however, it can be adapted for use with smaller and larger groups, including entire classes (Brown, 1985). The technique also can be use in a peer-tutoring situation (Palincsar & Brown, 1988).

Research studies. The Reciprocal Teaching approach has been used with a variety of students, including those categorized as learning disabled and hearing impaired (Brown, 1985; Brown & Palincsar, 1987; Andrews, 1988). While it has been used at the elementary, secondary, and post-secondary levels, most of the research of this approach has been conducted on junior high school students with average reading decoding skills but below-average comprehension skills. Studies have taken place in laboratory settings, in classrooms with volunteer teachers, and in remedial reading classes with nonvolunteer teachers. As reported, in all cases, students taught reading strategies via Reciprocal Teaching made substantial, significant improvements over control groups on measures of reading comprehension. Furthermore, follow-up studies of students in all these research settings indicate that improvements in reading performance were to a large extent maintained (Brown & Palincsar, 1987).

But do the effects of Reciprocal Teaching transfer? Some studies have attempted to answer that question. Students who were taught via Reciprocal Teaching did better than their peers who were not so trained, on tests measuring comprehension of passages in social studies and science. These tests were given as a part of regular classroom activity outside of the research environment. These students also performed better on the Gates-McGinitie test of reading comprehension. In fact, their performance was quite impressive. Students were tested before and after four months of instruction, at which time a gain of four months would normally be expected in test scores. In fact, students instructed with Reciprocal Teaching, with the exception of one student who did not show a gain, averaged an increase of twenty months; the control group, on the other hand, only gained one month (Brown & Palincsar, 1987).

While used primarily with older students, Reciprocal Teaching has been tried with children as young as first graders. In a study to determine if the listening comprehension abilities of first graders designated as poor listeners could be improved via Reciprocal Teaching, the approach once again produced dramatic and significant improvements in the performance of the students (Brown & Palincsar, 1987).

According to the developers, preliminary findings from research suggest that both students with learning disabilities and those with a low average range of IQ could benefit from Reciprocal Teaching, but the method by which instruction is provided may need to be modified somewhat. What may work best with these students is the teaching of

strategies on an individual basis, as opposed to teaching them in groups, the more usual approach (Brown & Palincsar, 1987).

One other study also should be mentioned: Andrews' (1988) examination of the Reciprocal Teaching method in teaching four prereading skills (spelling, book reading, story retelling, and word recognition) to five- to eight-year-old children with severe-to-profound and profound hearing losses. Students taught these skills via Reciprocal Teaching significantly outperformed control group students taught by traditional methods. While Andrews' research focused on skill as opposed to strategy instruction, the positive results noted with the young students naturally leads to speculation about this method's use in instructing older hearing-impaired students in higher-level reading strategies.

Role of the teacher. Reciprocal Teaching obviously is a very teacher-dependent approach. It is preferable that teachers undergo some formal training to learn to use this method. The training approach used in the Urbana School District in Illinois, one of three sites for a current OSE Reciprocal Teaching Implementation Grant, is an excellent training model. Carole Fine (1988), a resource teacher for learning disabled students, serves as a coordinator of the Urbana project. She reports that the 14 teachers who were selected to participate in the project during the 1987-1988 school year were provided one and one-half days of training with Dr. Palincsar. Training included lectures, discussion, videotape viewing, simulation, and demonstration of the technique being used with students.

"...Reciprocal Teaching requires teachers to think on their feet..."

Generally, newly-trained teachers are expected to use Reciprocal Teaching daily for ten consecutive school days and at least twice a week after that (Fine, 1988). The coordinator, visiting classrooms after teachers begin to implement the procedure, provides feedback and coaching. In addition, several group meetings of participating teachers are held throughout the year.

During the second project year (1988-1989), a coaching network, composed of teachers who used Reciprocal Teaching the first year of the project, is being formed. These teachers help others new to the method. Also available to the new teacher are scripts prepared for optional use and a bibliography of materials judged to be useful.

Fine (1988) reports that the presence of an "expert" teacher who can come into the classroom and teach a class using Reciprocal Teaching while the newly-trained teacher observes is a particularly valuable training method. Videotaping of teachers prior to their involvement in Reciprocal Teaching also has been helpful. Coaches use the tapes to analyze the teaching styles of the to-be-trained teachers, thus gaining a better understanding of the type of assistance each teacher will need.

While this type of training and ongoing support of teachers learning Reciprocal Teaching is the ideal, involvement in formal training is not thought absolutely necessary in order to employ this approach. A training manual specifically designed for educators who want to use this method or train others to do so is under preparation by Dr. Palincsar (Palincsar, 1988).

At the Urbana site, Reciprocal Teaching has been taught to students in both small and large groups, including full classes. Instruction has taken place in regular classrooms, resource rooms, and in self-contained, cross-categorical classes (Fine, 1988).

Children in Reciprocal Teaching classes are introduced to strategies through worksheets that give them some initial, minimal competency in using the strategies in isolated contexts (Fine, 1988). Passages from basal readers and a variety of other reading materials can be used with this approach. However, Palincsar has stressed the importance of selecting passages that can be decoded by students with accuracy: the standard that has been adopted is an accuracy of 80 words per minute, with no more than two errors (Palincsar, 1986b).

In sum, Reciprocal Teaching holds promise for instructing several categories of special education students in reading and listening. Furthermore, the developers believe that the method could be used within other content areas such as in mathematics to enhance arithmetic reasoning (Brown & Palincsar, 1987).

As a teaching method, Reciprocal Teaching requires teachers to think on their feet, to be sensitive to students' needs and, perhaps most essential but difficult of all, eventually to relinquish some control of the instructional process to students. If successful, however, Reciprocal Teaching can lead to enhanced thinking skills, not only for students but teachers as well.

The Strategies Intervention Model: Helping Learning Disabled Students Develop Learning Competence

The Strategies Intervention Model was originally developed by Donald Deshler, Jean Schumaker and their colleagues, at the University of Kansas Institute for Research in Learning Disabilities. This model, which incorporates the Learning Strategies Curriculum, was specifically designed to help learning disabled adolescents cope with the rigorous demands of the secondary curriculum (Deshler & Schumaker, 1986). Since its development, the Learning Strategies Curriculum has been adapted by the Institute for use with learning disabled students in the fifth and sixth grades and with older students at the college level.

The goal of the Learning Strategies Curriculum is to teach learning disabled students how to become more effective, efficient, and independent learners. Instruction is organized into three major strands: the first is reading-oriented and focuses on techniques for acquiring information from written materials. Strategies taught within this strand include Word Identification, Visual Imagery, Self-Questioning, Paraphrasing, Interpreting Visual Aids, and Multipass. The Multipass strategy is designed to help students to process information from textbooks (Deshler & Schumaker, 1986).

The second strand focuses on identifying and storing important information. Included are the Listening and Notetaking, First-Letter Mnemonic, and Paired-Associates Strategies (Deshler & Schumaker, 1986).

Strand three helps students to write and to demonstrate competence in academic tasks such as report writing and test taking. Included in this strand are Sentence Writing, Paragraph Writing, Theme Writing, Error Monitoring, Assignment Completion, and Test Taking Strategies (Deshler & Schumaker, 1986).

Students are taught a set of self-instructional steps for each strategy. When faced with an appropriate application for the strategy, students are to use it following the steps they have learned (Deshler et al., 1984b).

In teaching these strategies to students, teachers employ a multistep process that includes analyzing the current learning habits of the student; describing the strategy and the steps to using it; modeling the strategy using think aloud techniques; requiring the student to rehearse verbally the steps of the strategy; and providing opportunities to apply the strategy in controlled materials similar to those found in school settings and, later, with actual classroom materials. During instruction and practice, teachers provide information and corrective feedback (Deshler et al., 1981; Deshler et al., 1984a).

"The goal...is to teach learning disabled students how to become independent learners."

Throughout the instructional process, the teacher is cued to discuss when to use the strategy and how to identify situations related to strategy use. Too, students are prompted to become actively involved in the learning process; they are to describe how they are thinking about the use of the strategy, to identify situation-based modifications in the strategy, and to monitor their progress toward successful and independent use of the strategy.

Considerable attention is paid to instructing students explicitly in how to regulate their use of these learning strategies, as well as in the usefulness of the strategies outside the training environment (Deshler & Schumaker, 1986). In fact, students are taught to generalize the learned strategies to appropriate situations in and out of the classroom (Ellis et al., 1987b).

This training for generalization is introduced during instruction, which often takes place in the resource room. Ideally, students will receive prompting and reinforcement for strategy use within their regular classroom as well. As Deshler and others have noted, for generalization to occur, the regular classroom teacher should prompt and reinforce students' strategy use (Deshler & Schumaker, 1986; Ellis et al., 1987b). Indeed, some think that strategies intended to produce such permanent products as themes would be taught more successfully within the regular classroom (Beals, 1983; Ellis et al., 1987a).

Clearly, under ideal conditions, resource-room and regular-classroom teachers collaborate and coordinate students' strategy instruction. The degree to which such collaboration occurs varies from school to school. And while collaboration is more likely at the elementary level, it is possible at the secondary level, too (Lenz, 1988).

Instructional principles. Several overriding principles guide the instruction in the Learning Strategies Curriculum. First among them is the need to create an environment in which students can

experience success. This is a crucial feature of any program for students with learning disabilities, most of whom have experienced failures throughout their schooling. Similarly, motivational activities are integral parts of the learning activities, since these students often are lacking in this area as well (Deshler & Schumaker, 1986). A prominent feature of the whole Strategies Intervention Model is its acknowledgement that student learning is influenced by motivation and social skills as well as by academic factors. Therefore, this model includes components that specifically address these crucial areas of student need (Deshler & Schumaker, 1986).

The developers realize that the time available for students to be instructed in strategies decreases as they progress through the upper grades. Therefore this approach is designed to be as time-efficient as possible (Deshler & Schumaker, 1986).

Research results. What results can be expected by special educators using this program? Most of the research of the Learning Strategies Curriculum has been conducted by the University of Kansas Institute for Research in Learning Disabilities. These studies generally employ repeated replications, multiple base-line designs to determine individual student progress over time. The Institute reports that prior to strategy training, students generally show little evidence of strategy use. However, following instruction, students exhibit marked gains, a finding of all studies conducted by the Institute (Deshler & Schumaker, 1986).

Results of research published in professional journals support this contention. For example, one study of the Multipass strategy--the strategy designed to help students acquire information from text--indicates that students instructed to use the strategy made major gains on teacher-designed tests to measure reading comprehension of grade-level text material, and they substantially improved their test grades in the regular classroom (Schumaker et al., 1982).

School district involvement. Involvement in the Learning Strategies Curriculum requires that schools or districts desiring to have teachers trained in this approach commit to a thorough staff training program provided by trainers approved by the Institute. Often these trainers are from the district in question or another one close by. The developers point out that significant student gains are strongly related to the level of staff training (Deshler & Schumaker, 1986).

Training generally involves a three-year commitment, with three to five days per year devoted to staff inservice (Lenz, 1988). Instructed in one strategy at a time, teachers then teach that strategy to their students; after this, they share experiences in sessions designed to encourage mutual problem solving (Lenz, 1988).

In one year, teachers are usually trained in three strategies, with training structured to allow for competency to be reached in one strategy before the next is approached. Newly-trained teachers are encouraged to consult with and learn from one another in informal support groups meeting between the formal training sessions (Lenz, 1988).

As mentioned earlier, teachers trained in the Learning Strategies Curriculum are usually special education teachers who instruct their students in a resource room. Hence it is there that students are most likely to be introduced to strategies and to practice their use.

A teacher manual for each strategy assists the teacher in instructing students. The manual directs the teacher to the types of curricular material to which the strategy should be applied· some of the manuals contain reproducible activity sheets (Lenz, 1988).

"...Learning Strategies Curriculum provides a very structured, organized method of strategy instruction."

It is important to note that adolescent students should be reading at the 4th grade level to successfully learn and transfer use of the strategies to regular classroom material. However, for such strategies as Sentence-Writing, Test-Taking, and those designed for younger children, a lower reading level will suffice. Simple modifications of a number of the other strategies such as memorizing lists and paraphrasing text also allow for broader implementation (Lenz, 1988).

Goals of the program. While the Learning Strategies Curriculum has as a general goal, the production of an independent learner, its more immediate task often is the improvement of students' performances on specific academic tasks required for school success. Mike Hock, a teacher who has used the Learning Strategies Curriculum with senior high learning disabled students, has reported that his goal when working with high school students is to help them earn a diploma (Hock, 1988).

Hock's sentiments reflect the fact that the learning strategies approach is often used in an attempt to save students from failure. As an example, the Harford County Schools in Maryland,

working with Dr. Donald Deshler, Director of the Institute for Research in Learning Disabilities, and Dr. Karen Harris, Assistant Professor at University of Maryland, recently produced curriculum guides in math and writing instruction that incorporated the instructional approaches found in the Learning Strategies Curriculum. One main motivation for this effort was to help the district's learning disabled students acquire the skills necessary to pass statewide competency tests--passage of which is necessary to receive a high school diploma (Harford County Schools, 1985; Harford County Schools, 1988).

The fact that the Learning Strategies Curriculum is often used in a "fix it" situation should not detract from its ability to be used in a more comprehensive, preventative mode. Nor does its extensive use with learning disabled youngsters prohibit its practice with other populations of students. For example, researchers at the University of Florida have been investigating the use of the Word-Identification strategy with mentally retarded children in the third grade and the Broward County School District in Fort Lauderdale, Florida has implemented the curriculum as part of it dropout prevention program (Lenz, 1988).

The Learning Strategies Curriculum provides a very structured, organized method of strategy instruction. No doubt much of the demand for training in this approach--to date, 30,000 teachers throughout the country have been trained--is attributable to the positive results noted by teachers (Lenz, 1988). This success, one suspects, is related to both the required long-term commitment to formal training and the deliberate teaching of one strategy at a time.

Direct Explanation Model--Improving Teacher Talk

The Direct Explanation Model focuses on the role of the teacher in explaining reading strategies and the reasoning processes behind them to elementary students, particularly those experiencing difficulty in compre' ension. Duffy, Roehler, and the other developers of this method from the Institute for Research on Teaching at Michigan State University believe that low-ability readers need knowledge of strategies in order to become better readers. They point to research indicating that good readers use strategies to overcome comprehension problems in reading, but poor readers do not. (Duffy et al., 1987c).

Duffy and his colleagues (1987b) believe that teachers need to be taught how to make effective decisions when teaching reading; in short, teachers need to learn how to modify basal text lessons by recasting the skills presented therein into useful strategies. According to Duffy and others, basal texts--the source of much reading instruction--seldom present reading skills in a strategic manner. Instead, these texts present skills without including the rationale for and reasoning behind the skill.

"...teachers are taught how to plan explanations and how to respond to students' misunderstandings of the reading process."

In addition, Duffy and Roehler (1987) stress that teachers should provide their strategy instruction by making explicit the reasoning associated with strategy use. In other words, the developers believe that teachers need to think out loud while explaining reading strategies.

Role of the teacher. Teachers are trained in Direct Explanation with a method similar to that which they will later use to teach their students. Teachers are given explicit instruction of what they should do, a rationale for why they should do it, a model of the thinking process involved when teaching strategies, an opportunity to practice, and coaching as they try implementing the teaching procedure (Roehler et al., 1986). In sum, teachers are taught how to plan explanations and how to respond to students' misunderstandings of the reading process (Roehler & Duffy, in press).

One technique used in implementing the Direct Explanation model at the school level is the establishment of the principal as the instructional leader and coach. John Busch (1988), an elementary school principal in the Hartford, Michigan, school system, has functioned in this capacity. To help teachers to learn and implement the Direct Explanation Model, Busch uses a four-step process recommended by the developers. He first meets with a teacher to discuss the goal of the lesson: what the student should learn, when the student should use what is learned, and how the student should apply this knowledge. Next, Busch observes the teacher giving the lesson. Following the lesson, students are interviewed: they are asked what they have learned, when they should use the knowledge, and how they might apply it. Finally, the principal meets again with the teacher to review data collected from the observation and student interviews. Busch reports that this method has been

exceptionally helpful to newly-trained teachers, for it encourages them to reflect upon their teaching and to refine their use of this method.

Herrmann (1988b) has identified several decisions the teacher should make when planning for a direct explanation lesson. For example, the teacher needs to decide what reasoning process to teach, why it is important, and when the student should use it; determine how the reasoning process or strategy works; identify passages and examples from text that do and do not illustrate the reasoning process to be taught; assess the textbook's adequacy in presenting information about the reasoning process to be taught; determine how the lesson should be introduced to the class and how its usefulness should be explained; decide what to say and do while modeling when and how to use the reasoning process; identify places in the text where students could apply the process; and finally, try to anticipate the types of problems students may encounter learning when and how to use the reasoning process.

The teacher begins a Direct Explanation lesson by providing background vocabulary and creating interest for the basal story to be read (Roehler & Duffy, in press). The teacher then teaches a strategy by describing and modeling the reasoning process associated with the strategy. Students are given examples of how the strategy could be applied and are provided guided practice situations. Students are coached as they try to use the strategy. This support is gradually faded as students become more proficient in strategy use (Duffy & Roehler, 1987).

The effective presentation of a Direct Explanation lesson is dependent upon the mental modeling provided by the teacher. This thinking out loud, which make explicit the thought process behind a strategy's use, is intended to provide students with insights into the reasoning behind a strategy's use. Review of some of the published examples of mental modeling is highly recommended (for example, Herrmann, 1988b and Duffy, Roehler, & Herrmann, 1988).

Research results. Several studies of the Direct Explanation Model have been conducted. The first question researchers attempted to answer was, "Can teachers be taught to be more explicit in teaching students strategic reading skills?" Results of these studies indicate that they can. It was shown that teachers can be taught to recast textbook skills as strategies and to teach the reasoning processes associated with these strategies (Duffy et al., 1986a; Duffy et al., 1987c, Herrmann et al., 1985).

Next, studies examined the effect on students of being taught by the Direct Explanation Model. Poor readers increased their awareness of the strategies taught as well as their use of strategic reasoning (Duffy et al., 1986a; Duffy et al., 1987c). These children also significantly out-performed control students on the word-study subtest of the Stanford Achievement Test. Interestingly, however, significant differences were not noted between these groups on the comprehension subtest. Reasons for this "no significant difference finding" could be explained by a number of factors, such as 1) the emphasis in basal texts on lower-level skill tasks, 2) the lack of suitability of the standardized test format for assessing students' reading behavior, and 3) the difficulty in showing growth over a short period of time with at-risk students (Duffy et al., 1987c).

"Poor readers increased their awareness of the strategies taught as well as their use of strategic reasoning."

Duffy and his colleagues (1986b) also studied variations among teachers trained in the Direct Explanation approach and the impact these variations had on student performance. While the Direct Explanation approach proved to have generally enhanced students' awareness of reading strategies when the instructed students were compared to those not receiving the intervention, considerable differences were noted in performance among the classes instructed by this approach (Duffy et al., 1986b). To determine possible causes of these variations, transcripts of lessons of the experimental teachers were analyzed. Results indicate that relatively subtle differences in what teachers say during instruction can make marked differences in students' strategy awareness. Teachers who produced greater awareness among their students did not require strict memorization of steps in applying a strategy or memorization of arbitrary definitions. Instead, they described the strategy to be learned as a cognitive process requiring flexibility and adaptation (Roehler et al., 1986). These teachers emphasized the reasoning associated with the strategy by both explaining and modeling the thinking process involved. They also showed students how the strategy could be used in a variety of situations outside the school environment. In addition, more effective teachers provided more instruction at the beginning of a lesson and elaborated on responses given by students (Duffy et al., 1986b). These findings have great relevance for

how this and other methods of strategy instruction are best taught.

In a current study of Direct Explanation, collaborative teams have been formed in participating schools. These teams include teachers learning the method as well as the school principal, who assumes the role of coach by assisting the teacher in thinking through planning of the lesson and in evaluating it after it has been taught. The team as a whole provides opportunity for mutual problem-solving and support (Duffy, 1988).

"Teachers who produced greater awareness among their students did not require strict memorization of steps..."

In a similar study, Herrmann (in press) investigated the effects of peer-monitoring and peer collaboration on preservice teachers' knowledge structure about effective strategy instruction. Preservice teachers enrolled in a reading methods course were teamed with inservice teachers enrolled in a reading practicum course. Preliminary results indicate that preservice teachers who participated in field experiences that included peer-monitoring and peer collaboration developed more coherent and integrated knowledge about strategy instruction than did the preservice teachers who did not participate in such a field experience.

While much of the developmental work for the Direct Explanation Model has occurred in the subject of reading, the effects of this approach have been investigated in other content areas, for example mathematics (Herrmann, in press).

The Direct Explanation Model is a challenging one. Mental modeling, one of the key components of this approach, is very difficult for some teachers, as is conceptualizing the difference between skills and strategies (Roehler & Duffy, in press, and Roehler et al., 1986). Too, Busch (1988) reports that the anxiety level of teachers tends to be very high as they begin to work with this method, but as teachers meet with success, their anxiety quickly subsides. The establishment of collaborative teams and effective instructional leadership should help provide the support that teachers need as they learn to apply the Direct Explanation Model in their classroom (Duffy, 1988).

Summary

The three strategy interventions just described give the educator an idea of the range of developed approaches for teaching reading strategies to students with learning problems. Of course, these and other interventions serve different purposes and place different demands upon the professionals involved with them.

Educators interested in these or other developed approaches should consider several factors in determining which is most suitable for their situation. The ages and capabilities of the students to be instructed as well as where in the curriculum the strategy instruction would be introduced are important considerations. Furthermore, the opinions and teaching styles of those who will use the instruction, the immediate and long-term outcomes expected of it, and the resources of the district or school involved would also have an impact on this decision.

Educators should be aware, too, that strategy instruction does not require the use of a developed approach. While no one would dispute the advantages of a well-researched intervention, one with available trainers and consultants as well as prepared media and materials, it is not always possible for school systems to find the resources to support such participation. That fact, as Pressley and his colleagues (in press-a) point out, should not deter interested professionals from implementing strategy instruction. He offers several recommendations for ways professionals at the district or school level can go about developing their own approaches for strategy teaching.

First, he suggests reading books and articles about cognitive and metacognitive strategies, to obtain an idea of which strategies are available. Specific books suggested are T.G. Devine's (1987) *Teaching Study Skills*, 2nd edition; Ellen Gagne's (1985) *The Cognitive Psychology of School Learning*; Richard Mayer's (1987) *Educational Psychology: A Cognitive Approach*; Gerald Duffy and Laura Roehler's (1986) *Improving Classroom Reading Instruction*; and books by Deshler and his associates at the University of Kansas, such as the 1984 publication, *Paraphrasing Techniques* by Schumaker, Denton, and Deshler (Pressley et al., in press-a). Recent publications by the Association for Supervision and Curriculum Development such as *Dimensions of Thinking:*

A Framework for Curriculum and Instruction by Robert Marzano and others (1988) and *Strategic Teaching and Learning: Cognitive Instruction in the Content Areas* edited by Beau Fly Jones and others (1987) also are valuable resources for professionals desiring more information about these methods of instruction.

Design of strategy instruction programs, according to Pressley, should begin with the selection of a few across-domain strategies that address observed strategy deficiencies in students, that accomplish educationally important goals, and that have been proved through research to be effective.

As to actual teaching of the strategies, Pressley stresses the use of "powerful" techniques. What are some of these techniques? Analysis of strategy instruction approaches reveals several characteristics, procedures, or components that cut across many of these methods and that are believed to contribute to successful acquisition and use of strategies. The next section identifies and discusses some of these commonalities.

SECTION FIVE

The Do's of Strategy Instruction

From research and practice have emerged a group of strategy instruction components and characteristics that are thought to lead to more effective and successful strategy training and use. Depending upon the context in which strategy instruction is to occur as well as the students and strategies to be taught, some components are clearly more important than others; not all are always necessary.

Furthermore, while for convenience and clarity these components are discussed in this section as individual entities, educators should be cautioned that doing so is somewhat misleading. The strength of any given component is no doubt due to its interaction with others. This fact has made, and will continue to make, difficult the task of determining empirically the value of isolated components in effecting desired changes in student learning.

What the following discussion is intended to do is to provide the educator with some guidance (1) in judging the adequacy of a developed strategy instruction approach, and/or (2) in determining which component should be included in a locally-developed approach. Some of these components relate to the planning of instruction; others pertain to techniques and methods used by teachers when instructing students. What are these important planning and implementation components of strategy instruction?

Planning for Instruction

One of the most critical aspects of planning for strategy instruction is determining whether students will benefit from it. This decision often relates to whether a student possesses necessary prerequisite skills and knowledge (Meichenbaum, 1985; Brown et al., 1983; Graham et al., 1987; Deshler et al., 1984b; Palincsar, 1986b). Most developed strategy instruction approaches require that students be capable of functioning at a specified skill level. For example, as mentioned earlier, adolescents involved in the Learning Strategies Curriculum are expected to be reading at the fourth grade level or above (Deshler et al., 1984b;), and Palincsar has indicated that students involved in Reciprocal Teaching to improve reading comprehension should be able to read 80 words per minute with no more than two errors (Palincsar, 1986b). (Obviously these criteria are adjusted when the approaches are to be used for different purposes or with different students. In other words, first graders being instructed in Reciprocal Teaching to enhance their listening skills would not be expected to meet the same criteria as seventh graders being instructed in reading comprehension.) Students will also differ in the extent to which they currently use strategies (Deshler & Schumaker, 1986). All these factors lead to the conclusion that strategy instruction

approaches should be designed to incorporate an assessment component to help determine students' knowledge and skill levels and current strategy proficiences.

After the determination has been made that a student or students will benefit from this type of instruction, planning should focus on how to structure an environment that would enable students to be active participants in the learning of strategies. Students must have opportunities available to them for exploring and articulating their thinking processes. Presenting strategy information in a "lecture only" format works against the development of self-directed learning that is the aim of this method (Dowd, 1988; Harris, 1988; Palincsar, 1988; Meichenbaum, 1985).

Most educators acknowledge the pivotal role that motivational states play in learning. Attention to motivation is particularly crucial in strategy instruction targeted to handicapped students: following years of failure, such students often exhibit negative concepts about their ability to learn. Thus instruction should be purposely planned to help students develop positive beliefs about their learning abilities (Ellis et al., 1987a; Borkowski et al., 1984; Brown et al., 1983; Graham et al., 1987).

"Students need...explicit instruction about the importance of the strategy, as well as how and when to use it..."

A motivational component can be overt and direct, but it can also be interwoven throughout the instructional process. Strategies that challenge yet are not so difficult as to frustrate and discourage can foster motivation (Pressley et al., in press-a). Instilling in students a sense of control over their learning tasks and thinking also is thought to lead to increased motivation (Oka & Paris, 1987), as is the supplying of appropriate feedback and encouragement (Brown & Palincsar, 1987; Brown, 1985; Deshler et al., 1981; Deshler et al., 1984a).

Finally when strategy instruction is being planned provision should be made for incorporating an evaluation component to assess periodically the effectiveness of the instruction (Palincsar, 1988; Harris, 1988). Student progress should be reviewed to determine if the expectations for the instruction are being met, and, if not, what adjustments are needed in the instruction. Once strategies are learned, as Harris points out, teachers should determine if the strategy is being appropriately maintained and generalized. If not, booster sessions and strategy reviews should be provided (Harris, 1988).

The Teaching of Strategies

How should strategy instruction be presented to students? Several instructional variables are among the components thought to contribute to successful implementation of strategy instruction in the classroom. When introducing a strategy, teachers should build upon the prior experiences and knowledge of students (Brainin, 1985; Turnure, 1986; Paris & Oka, 1986a; Delclos et al., 1984). New subject-area knowledge as well as new strategy knowledge should be linked to the student's existing knowledge base. Students also should be taught the relationship between and among strategies and how they complement each other.

Students need to be informed of why they are learning the strategy. They need explicit instruction about the importance of the strategy, as well as how and when to use it, in and out of school. This knowledge has been shown to be very important in determining whether or not students transfer their use of strategies to appropriate school and other situations (Brown et al., 1983; Palincsar, 1986b; Brown & Palincsar, 1982; Brown & Palincsar, 1987; Ghatala, 1986; Borkowski et al., 1986; Brainin, 1985; Paris & Oka, 1986a; Pressley, 1986; Meichenbaum, 1985; Duffy & Roehler, 1987; Pressley et al., in press-a; Graham et al., 1987; Graham, 1988).

Strategies need to be taught explicitly and clearly. Such explanation should include teacher-modeling of the strategy being taught (Ellis, 1986; Ellis et al., 1987a; Brown & Palincsar, 1982; Pressley & Levin, 1987; Paris & Oka, 1986a Duffy & Roehler, 1987; Brown & Palincsar, 1986; Englert & Raphael, 1988; Deshler & Schumaker, 1986; Graham et al., 1987; Graham, 1988; Harris, 1988). As discussed in the previous section, Duffy & Roehler (1987) and Herrmann (1988b) suggest that the teacher model not just the action involved in applying the strategy but also the thinking. The teacher's thinking out loud helps the student to understand how to go about using the strategy and why. Modeling, particularly mental modeling, is considered by many to be one of the most important components of strategy instruction, but it is also one of the most difficult for teachers to master.

While strategy instruction should teach students the steps or processes for effectively applying a strategy, it should also teach students how to use strategies flexibly and appropriately (Palincsar,

1988; Sheinker, 1988; Roehler et al., 1986). Instruction should not lead the student to conclude that a strategy's use must be rigorously adhered to in all situations (Allington, 1988).

Strategy instruction must incorporate ample opportunities for practice. As with the learning of anything, practice is necessary to develop proficiency (Ellis et al., 1987a; Brown & Palincsar, 1982; Pressley, 1986; Duffy & Roehler, 1987; Paris & Oka, 1986a; Graham et al., 1987; Graham, 1988). But it is important that practice occur in a variety of materials (Feldman, 1988) and, whenever possible, that it involve meaningful tasks (Harris, 1988). In The Strategies Intervention Model program, for example, students practice instructed strategies in controlled materials to reinforce the instruction, then they practice with regular classroom materials (Deshler et al., 1981; Deshler et al., 1984a).

Throughout strategy instruction, appropriate feedback and direction need to be provided to students (Deshler et al., 1981; Harris, 1988; Brown & Palincsar, 1987; Graham, 1988). Sometimes this feedback is spontaneous and immediate, as in the case of such highly interactive approaches as Reciprocal Teaching. For other approaches, e.g., the Learning Strategies Curriculum approach, direction and feedback are more structured but are clearly embedded throughout the procedure.

Teacher-student interactions also play an important role during the presentation and teaching of strategies. Teachers need to be sensitive to the learning needs of individual students and through appropriate interaction lead students to a greater understanding of the strategies being taught and how they can be used (Duffy et al., 1987c; Palincsar & Brown, 1988).

Over the course of strategy instruction, control of the strategy must be transferred from the teacher to the student. In other words, students need to move from being other-regulated to being self-regulated if they are to apply these strategies in appropriate situations on their own, without external prompting (Palincsar, 1988; Brown & Palincsar, 1987; Brown & Campione, 1986; Meichenbaum, 1985; Brown & Palincsar, 1982; Graham et al., 1987; Harris, 1988; Duffy & Roehler, 1987).

This fading of teacher control obviously must occur gradually, often requiring that the teacher play many roles along the way. For example, in Reciprocal Teaching, teachers function first as informants, then as mediators and facilitators, and then, after control has been transferred, as reflectors and coaches (Palincsar, 1988).

Finally, it is unwise to assume that, because students learn a strategy, they will use it in appropriate situations beyond the training setting, even when they know when the strategy could be used. Therefore, effective strategy instruction needs to incorporate generalization opportunities (Deshler et al., 1981; Deshler et al., 1984a; Pressley & Levin, 1987; Palincsar, 1986b; Meichenbaum, 1985; Ellis et al., 1987b; Ryan et al., 1986; Graham & Harris, 1987; Harris, 1988; Graham, 1988).

For special education students receiving strategy instruction in a resource room, such generalization ideally would entail close cooperation between the resource and regular classroom teachers: the latter could prompt, cue, and reinforce the use of the strategies outside the resource room (Schmidt, 1984; Ellis et al., 1987a; Ellis et al., 1987b). When introduced in the regular classroom, strategies can easily be generalized to content area learning. Indeed, many believe that the ideal way to teach strategies is to integrate strategy instruction with content teaching (Feldman, 1988; Dowd, 1988).

"Teacher-student interactions also play an important role during the presentation and teaching of strategies."

Strategy approaches differ in their emphases on these various components, and some approaches do not include all of them, all of the time. But special educators planning or evaluating strategy instruction interventions would be wise to consider the merits of each of these components when designing or selecting strategy instruction approaches.

Too, the educator needs to be aware that other factors, particularly the teacher's role, also are crucial to successful strategy instruction. Strategy instruction is very much a teacher-dependent method. Therefore it is not surprising that the effectiveness of this method is influenced more by the teacher's instruction than by any other single factor.

Although specific teacher actions such as modeling have been identified as contributing to more successful strategy instruction, the relationship between the teacher and effective strategy instruction extends far beyond the execution of specific techniques. In the next section, the demands and rewards of this method and the implications for training teachers to teach strategies will be addressed.

SECTION SIX

Teaching Learning Strategies: More than Technique

Strategy instruction has been described as a labor-intensive approach to instruction, demanding that teachers assume an active, decision-making role. As is apparent from the components described in the previous section, good strategy teaching requires ongoing assessment, judgement, and thinking.

Also, the method requires risk-taking. Simply deciding to teach strategies involves risks: even when a teacher has ascertained the appropriateness of strategy instruction for students, he or she cannot be certain that it will work. Furthermore, some teachers consider the transfer of control to the student, a necessary component of this type of instruction, as a risky undertaking.

The Role of the Teacher

Teachers who commit to strategy instruction must be willing to grow and to become more reflective in their practice. Mike Hock (1988), for example, reports that his teaching of the Learning Strategies Curriculum to learning disabled students has resulted in his growth as a teacher, and that his use of this approach has made him a more strategic thinker.

Indeed, this development of more strategic behavior on the part of the teacher may not be just a nice fringe benefit of strategy teaching, but rather a necessary component of it. A strategic approach truly requires that teachers utilize their metacognitive capabilities when teaching. With experience, strategy instruction is transformed from a way of teaching to a way of thinking.

Teachers must, as Keith Lenz (1988) states, step back occasionally, evaluate their instruction and its impact on students, and make necessary adjustments. Also, teachers need to plan and think through how they are going to present some of the complex reasoning processes that are associated with strategic learning (Herrmann, 1988a). In sum, successful strategy instruction requires teachers to be reflective, thoughtful, well-prepared, and growth-oriented.

Can teachers be taught such a demanding role? It is known that many teachers already use elements of strategy instruction in their teaching without labeling them such. For example, Sue Derber (1988), a first grade teacher from Springfield City Schools in Illinois, when first introduced to Reciprocal Teaching, discovered that she had already been using some strategy techniques. This is not an unusual response. While these teachers may not be providing this instruction in the most effective way possible, their teaching is targeted to end goals--increasing learner capabilities and independence--that are similar to the goals of strategy instruction.

Many of these teachers would probably be very receptive to learning more about strategy instruction and using these methods in the classroom. Yet others, both new and experienced, will not be comfortable with the concept initially; some may never be. One or many factors--differences in teaching style or philosophy, use of another instruction program producing good results, fear of the new--may keep some teachers at a distance.

That teachers will differ in their willingness to embrace strategy instruction should not dampen the enthusiasm of professionals at the school, district, or university level who wish to teach others about its potential benefits. That teachers will differ in their receptiveness to strategy instruction or to any new method of teaching is an ever present reality.

Learning to Teach Strategies

How, then, should teachers be taught to teach strategies? Ideally, strategy instruction should be introduced at the preservice level. However, if this exposure is confined to a unit in a teaching-methods course at a college or university, it is doubtful that the future teacher would gain little more than an awareness of the approach, its underlying concepts, and forms of implementation. Ideally, preservice programs would provide student teachers with the opportunity to practice and be coached in strategy teaching methods during field service experience. For this to occur, experienced teachers who teach strategy instruction need to open their classrooms to student teachers and serve as mentors to them.

If the prospective teacher does not receive extensive or intensive training in strategy instruction at the preservice level, inservice training may serve as the means by which a teacher is introduced to strategy instruction. District-sponsored programs, university courses, or peer interaction all are ways the practicing teacher may learn to use strategy instruction.

"With experience, strategy instruction is transformed from a way of teaching to a way of thinking."

It is advantageous for teachers to be trained in strategy instruction in much the same way that students are taught. Training should be built on what teachers already know, should be explicit, should include strong doses of motivation, should be structured to enhance the possibility of success, and should provide ongoing feedback. Sue Derber (1988) stresses the importance of modeling in instruction of teachers: it is important for teachers to have these teaching methods demonstrated.

Also helpful is coaching by an experienced teacher who visits the classroom, demonstrates strategy instruction with students, and observes the new teacher. (Fine, 1988). Such a coach could help the teacher work through implementation problems and serve as a motivational source. For example, Karen Harris (1988) indicates that teachers commonly try to go too far, too fast when they first begin to teach strategies. Starting the instruction with students experiencing the most learning problems, the teacher frequently becomes frustrated when the students do not progress as rapidly as had been hoped. This tendency of teachers to overreach could perhaps be minimized with advice and counsel from an experienced coach.

It is important for teachers to learn to rely extensively on each other for group problem-solving and reflection. Teachers successful with strategy instruction would perform a valuable service by sharing their experiences and observations with other teachers (Pressley et al., in press-a). This intra-faculty information exchange not only helps disseminate valuable information; it also promotes a sense of mutual support as well as an atmosphere of exploration and investigation of teaching techniques. Furthermore, collegial interaction promotes professional growth, encourages reflection, and establishes strategy instruction as an integral part of the instructional process.

Such collegial interaction could also facilitate communication and cooperation among special education and regular classroom teachers. As mentioned earlier, it is ideal for both to work together to help insure that students use the strategies that they have learned in appropriate situations in regular classrooms (Herrmann & Marshall, in progress).

Clearly, the above discussion highlights the longitudinal nature of learning to teach strategies (Herrmann, 1988a). Strategy training that relies *only* on a part of one course at the preservice level or on a one-shot continuing education session is not likely to produce the ideally-reflective strategy teacher. Hence while formal courses and training sessions will end, teacher learning must continue. Becoming proficient in strategic teaching is an evolutionary process that is greatly facilitated by the establishment of professional networks, which provide opportunities for mutual problem solving and growth in a real learning environment.

Unquestionably the teacher plays the pivotal role in strategy instruction, but teachers need support in their instructional efforts from their instructional leaders at the building and district level and from their peers. Additional implementation support can come also from the media and materials teachers use in their classrooms. The next section will discuss the appropriate role such media and materials can play in helping teachers be more proficient strategy teachers.

SECTION SEVEN

Media and Materials: Helpmates to Instruction

There is no question that media and materials *alone* cannot effectively instruct students or teachers in strategy use. However, well-conceived, well-designed media and materials can provide crucial assistance to teachers. As Brown and others (Brown et al., 1983) have pointed out, materials can influence the learning process, and modifying the design of materials is an avenue to improving learning.

Certainly, media and materials have already demonstrated their potential to assist in the teaching of strategy instruction. For example, The Strategies Intervention Model incorporates videotapes, worksheets and filmstrips (Lenz, 1988); worksheets are used to introduce strategies in the Reciprocal Teaching approach (Fine, 1988); and videotapes of students applying strategies have been used by Harris and Graham in their strategy instruction intervention (Harris, 1988).

But what about media and materials not specifically designed for use with a specific strategy instruction approach? As a result of much of the recent research in learning strategy instruction, increasing numbers of classroom materials are being developed that address the teaching of strategies. For example, some basal textbook publishers have recently produced reading series that include a focus on developing students' strategic reading skills. DC Heath has published one of these series. These basals and teacher guides incorporate instruction based in part upon the Informed Strategies for Learning approach developed by Scott Paris and others at the University of Michigan. The teachers' guide provides instructions to the teacher for helping students to preview; recall prior knowledge; set purposes; understand different ways of reading; understand different kinds of meaning; monitor, clarify and review comprehension; and respond to and apply different kinds of reading.

These texts are designed for use in regular classrooms by all students. Suggestions incorporated into the teacher guide show how the materials can be used with special needs children as well. These texts could be used with special education children in a resource room, self-contained classroom, or mainstream environment.

Some teachers without knowledge of or experience with strategy teaching would be able to use such basal texts effectively to teach strategies, but most teachers probably would not be able to (Allington, 1988; Sheinker, 1988; Herrmann, 1988a). The reason for this belief is that strategy instruction is very dependent upon human interaction. That interaction is *crucial* not just in the instruction of students, but also in the development of teacher proficiencies in this method. Tina Miller (1988), the executive editor for reading at D.C. Heath, freely admits that it is difficult for media and materials to provide the interaction that is thought essential for effective strategy instruction.

Role of Media and Materials

The fact that media and materials cannot alone carry the burden of teaching strategies should not be interpreted to mean that these items do not have a

role in this type of instruction. The truth is quite the contrary; media and materials have a key role to play in strategy teaching. First, readily-available classroom resources can provide considerable assistance to teachers who are learning to teach strategies. According to Keith Lenz (1988), the manuals in the Learning Strategies Curriculum that include reproducible worksheets are reported by teachers to be more helpful than workbooks or guides that only suggest activities. Media and materials that support strategy teaching also are desired by teachers who have completed training and are teaching strategies in the classroom. With the growing interest in learning strategy approaches among professionals, one would expect a growing demand by teachers for strategy-oriented materials; indeed, according to Carole Fine (1988), teachers involved with a Reciprocal Teaching project found that traditional instructional materials no longer met their teaching needs. Hence the clear message from those teaching strategies is that functional, strategy-oriented media and materials are a crucial part of the classroom environment.

Secondly, one of the current truisms in education is that media and materials drive instruction. Media and materials lead; teachers follow. The extent of this assumption can be debated, but the fact remains that the instruction of some teachers, particularly new ones, frequently is guided by the media and materials they use. If that is the case, then classroom materials that incorporate strategies may serve as the point of introduction to strategy instruction for many. And while media and materials alone cannot bear the burden of teaching teachers to be proficient strategy instructors, they may inspire them to seek out additional training in this method.

"...appropriately designed media and materials, wisely used, will foster and reinforce strategy learning..."

Also, some publishers do provide inservice training in the use of their materials. While this inservice cannot be extensive or long-term, it may provide teachers with an awareness and understanding that results in a purposeful use of media and materials and a desire for more in-depth knowledge.

Finally, subject area materials that prompt or reinforce strategy use can contribute to strategy learning and teaching. Such materials can help students generalize strategies learned in another subject or instructional setting (a resource room, for example). At the same time, they can prompt teachers in the use of strategies.

To summarize, while in most circumstances media and materials cannot play the leading role in teaching strategies, they can play an important supporting role. The extent to which they may do so, however, will depend upon their design. Thus educators may ask, "What design features would facilitate strategy teaching?"

Design Recommendations

Several design characteristics have been suggested by school and university professionals based upon their experiences with and observations of strategy instruction in the classroom. These characteristics are not necessarily unique to strategy instruction approaches, and few have been proven empirically to increase achievement of students. Yet, the following suggestions offer the school professional some guidance in selecting materials by identifying those design features thought to help teach or reinforce the principles of strategy instruction.

1. Most fundamental of all suggestions is that materials intended to teach strategies be consistently designed. For example, as Fine (1988) has pointed out, materials that are intended to teach reading comprehension strategies for finding the main point and summarizing should offer students varied and realistic activities for practicing these strategies. Providing workbook passages of increasing length and difficulty is one way this could be accomplished.

2. Materials should focus on presenting a few powerful, proven, teachable strategies (Pressley, in press-a; Palincsar, 1986b; Harris, 1988). In other words, materials should help teachers zero in on strategies that stand a good chance of assisting students in their learning. In the area of reading, strategies that help students to utilize summarization, to activate prior knowledge, to employ imagery, to understand story grammar, and to generate and ask questions fit this category (Pressley et al., in press-b). It is important that educators be aware, however, that information about strategies and their effectiveness changes over time (Graham, 1988; Harris, 1988). As more research is conducted, more will be learned as to which strategies should be taught to whom.

3. Classroom materials should help to activate students' prior knowledge (Pressley et al., in press-b). Preparing-to-learn is a crucially important

learning concept that is often ignored in student materials. Materials that include questions, activities, or other prompts at the beginning of a unit or section could help students link new information with what they already know.

4. Materials should help explain the reasoning behind a strategy's use. As Fine (1988) has indicated, materials frequently contain such directions to the student as "Read the passage and check the statement that best states the main idea," but seldom do they contain explanations for "how" to find the main idea or to summarize what has been read. Teacher presentations, along with text explanations of the reasoning behind the "how to" of strategy use, would help make evident to many students what currently is hidden.

5. Students need to learn how to be flexible in applying strategies as well as how to adjust their use of learned strategies (Sheinker, 1988; Allington, 1988). Media and materials can help demonstrate the decision-making involved in the selection and use of strategies as well as their appropriate and inappropriate applications. Curricular items that contain a videotape component showing students applying strategies may be particularly helpful. Other materials such as workbooks and activity sheets could provide the student with practice in flexible strategy use and with exercises that encourage students to develop their own strategies for addressing specific learning problems (Allington, 1988).

6. Generalization of learned strategies from the setting or subject in which the strategies are taught to the regular classroom or other subject areas has been problematic for special education students. Therefore, materials that contain prompts and cues embedded in content material such as social studies and science texts would be helpful to these students (Hock, 1988; Graham, 1988; Allington, 1988). In other words, questions that probe student thinking and/or activities that encourage systematic use of strategies, such as summarizing, generating questions, and developing imagery, could be incorporated in materials that do not explicitly teach strategies.

7. Just as students need explicit explanations about strategies and their uses, so also do teachers need good examples of how to introduce and teach strategies to students. Therefore, student materials intended to teach strategies should be accompanied by teacher guides and other items that contain examples of strategy teaching. These examples could be presented as sample dialogues between teacher and students or lesson outlines, to name two. Such illustrations may be particularly helpful to the teacher new to this instructional approach (Sheinker, 1988; Palincsar, 1988).

8. Enhancement of the teacher's understanding of his or her own way of thinking and teaching is an important goal of strategy instruction. Teachers need to take the time to think about their thinking if they are to make their thought processes explicit to students (Sheinker, 1988). Teacher guides could contain reminders that encourage teachers to reflect on their teaching of a specific strategy or unit. Special exercises and questions could also be included to assist individual or groups of teachers in investigating their own cognitive and metacognitive processes.

9. Students need to be assessed from time to time to determine their acquisition of information presented in instructional media and materials. While teacher guides often suggest methods for assessing students' content knowledge, seldom do they offer ways to measure students' strategic knowledge (Allington, 1988). Teacher guides should include assessment and evaluation suggestions; student materials as well could contain end-of-chapter or unit questions, that would direct students to assess their own understanding and use of strategies.

10. Teacher guides can be useful in providing not just the content and procedural guidance for strategy instruction, but also the encouragement needed by teachers attempting a new methodology. They can, for example, remind teachers to start small, and not to try to do too much, too soon (Sheinker, 1988). Providing "testimonials" and implementation hints from teachers is one way this could be accomplished.

11. Teacher guides can help put strategy instruction in perspective: it should not be thought of as an isolated approach to teaching or as a method for supplanting other valid teaching methods. Rather, strategy instruction represents an approach to learning and teaching that undergirds most instruction. Teacher guides can assist teachers to view instructional approaches in an integrated manner by providing examples of how such methods can be used together (Sheinker, 1988).

The Use of Media and Materials in Professional Education

Besides their role in the classroom, media and materials also can be valuable tools in training teachers, even though, as with classroom items, media and materials cannot teach this method alone. Manuals are available to teach teachers specific

approaches to strategy instruction (Palincsar, 1988; Lenz, 1988). The manuals often include written scripts. The scripts are not intended to be recited verbatim, but they are included to provide the novice with ideas, illustrations and examples of how to apply strategy instruction. It should be pointed out that some controversy exists as to whether scripting, even to provide examples, is a good idea: some fear that scripts imply that there is only one way to provide instruction (Roehler & Duffy, in press). Indeed, it is easy to see both sides of this argument. Perhaps scripts are most useful in situations in which a single teacher or small group of teachers are undertaking strategy instruction on their own, without other support. In such instances of little or no professional coaching and monitoring, scripts may give the interested teacher the direction necessary to take the first step in strategy teaching and may also lead to a deeper involvement in the method.

Perhaps one of the most powerful media that can be used in strategy training is videotape (Dowd, 1988; Sheinker, 1988). Tapes of other teachers teaching strategies and students using them give teachers an idea of how these methods can be applied, the behavior required of teachers, and examples of how students being trained might react Harris (1988) suggests that those involved in strategy training may consider developing a tape library of students using strategies. These tapes can benefit not just the teachers but also the children being instructed, since children can relate to peer modeling perhaps better than they can to teacher modeling.

Videotaping teachers before and during training also can facilitate teacher learning. In the Urbana Reciprocal Teaching project, for example, teachers are taped prior to training so that trainers can have a better understanding of their teaching styles and preferences, and therefore, can better tailor training to them (Fine, 1988). Taping teachers during training and as they apply what they have learned in the classroom allows teachers to see themselves in action. They then have a better idea of how they need to modify their teaching.

As mentioned in the previous section of this report, more attention to strategy instruction should be given at the preservice level. College texts should include sections that help create an awareness of strategy instruction methods, not just for education students but for their professors as well. Indeed, elementary and secondary schools involved in strategy instruction would perform a considerable service by inviting teacher educators and their students to observe, directly or through video, classroom applications of strategy instruction and by offering opportunities for student-teacher field experiences.

Although teachers represent the key component in strategy instruction, media and materials do have a significant role to play in classroom instruction of strategies and teacher training. It is important for the educator to realize, however, that that role has its limits, and that the nature of strategy instruction requires considerable human guidance, judgement and interaction. But it is hard to question the conclusion that appropriately designed media and materials, wisely used, will foster and reinforce strategy learning, not just among students but among teachers as well. Educators are advised that the Information Center for Special Education Media and Materials maintains a database of media and materials that are useful in the instruction of handicapped children. Some of these media and materials have been identified as possibly suitable for use in teaching or reinforcing strategy instruction. The Center, while it does not evaluate the adequacy of these items, does collect descriptive information that would be helpful to the educator attempting to locate appropriate classroom resources. An example of a database record is contained in Appendix B.

CONCLUSION

Much remains to be learned about strategy instruction as well as about when and how it can best be used for special education students. Areas of future research include the following:

- studies to determine instructor and other variables that work for and against performance of students (Palincsar, 1986a);
- studies to determine how students can best be taught to generalize strategies (Ellis et al., 1987b);
- evaluations of strategies themselves, to determine which parts make them work (Levin, 1986);
- analyses of which students benefit most from strategy instruction (Deshler & Schumaker, 1986);
- studies of how tests can be developed that will be sensitive to and measure students' strategic behaviors within subject areas (Duffy et al., 1987a; Arbitman-Smith et al., 1984).

In conclusion, it is hoped that this overview of strategy instruction and the issues that surround its teaching and use has given educators some points on which to reflect. The main ones, it seems, are that strategy instruction:

- has been successfully used with students with learning problems, including special education populations;
- should not be regarded as a quick fix or panacea;
- is teacher-driven: to be done right, it requires long-term commitment, growth, and reflection by teachers;
- should not be treated as an add-on to current curricular offerings, but rather, it should be interwoven throughout curricular offerings;
- can be assisted by the use of media and materials for classroom and teacher instruction.

Cognitive/metacognitive strategy instruction is an evolving method that will be refined as more is learned from research and practice. Given the time and thought necessary for effective implementation, this method has the potential to change the learning behavior not just of special education students, but of their teachers as well.

APPENDIX A
1988 Instructional Methods Forum Participants

Richard L. Allington, Ph.D.
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Dr. Allington has written widely in the area of reading and learning disabilities. Currently, he is involved in research to study the whole school day experiences of Chapter I and mainstreamed mildly handicapped children and the effects of educational reform activities on student participation in remedial and special education programs. His other interests include how schools respond to reading failure and how policy and regulation influence learning.

Bonnie Armbruster, Ph.D.
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Dr. Armbruster serves as a researcher at the University of Illinois Center for the Study of Reading. She has published several articles addressing issues related to learning from text. Her current interests are reading and studying in the content areas and characteristics of textbooks that affect learning.

Sue Austin
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Ms. Austin, as a special education teacher, served on the Harford County School Committee that oversaw the development of the district's curricular guide, *Teaching Writing to Students with Special Needs: A Learning Strategies Approach* (1988).

John G. Borkowski, Ph.D.
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During his career, Dr. Borkowski has studied contextual factors surrounding the development and generalization of strategic skills in young children. He is the editor, along with Professor Jeanne Day, of two recent books, *Intelligence and Exceptionality* and *Cognition in Special Children*, both published in 1987. Dr. Borkowski's interests include metacognition and inefficient learning; social contexts; and the emergence of cognitive skills in handicapped, normal, and gifted children.

Candace S. Bos, Ph.D.
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Dr. Bos is the co-author of the recent books, *Strategies for Teaching Students with Learning and Behavior Problems* and *Research in Learning Disabilities: Issues and Future Directions*. Her current interests are in research strategies that empower students to take control over their own learning, interactive teaching, and methodologies for integrating handicapped students in regular classes.

Lisa Pericola Case
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Ms. Case's recent master's thesis focused on the use of self-instructional strategy training to improve the math problem-solving abilities of learning disabled students. She presented a paper based on her thesis at the April 1988 AERA meeting in New Orleans and has worked with Drs. Karen Harris and Steve Graham on strategy intervention projects. Ms. Case's other interests include children's involvement in independent reading and learning strategies in all curriculum areas.

Paula Cauthen
University of South Carolina
Education Student

Ms. Cauthen is a student in the College of Education at the University of South Carolina.

Anna Uhl Chamot, Ph.D.
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Dr. Chamot, along with Michael O'Malley, has developed several instructional materials for limited English speaking students. Their *Language Development Through Content* social studies and mathematics texts, published by Addison-Wesley, incorporate cognitive and metacognitive learning strategy principles. Dr. Chamot has had articles published in an array of language oriented journals. She and O'Malley are the authors of the book *Learning Strategies in Second Language Acquisition*, to be published by Cambridge University Press in 1989.

Sue G. Derber
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Ms. Derber has been a first grade teacher for 19 years. Between 1984 and 1987, she was involved in a listening comprehension study involving reciprocal teaching approaches developed by Dr. Annemarie Palincsar. She has participated in the preparation of a video tape on reciprocal teaching and has presented sessions on reciprocal teaching at various workshops.

Michael Dowd
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Mr. Dowd is responsible for developing and delivering staff development activities to regular and special education teachers. As a classroom teacher, he was actively involved in teaching metacognitive study strategies. He maintains an interest in active learning and teaching with an emphasis on metacognitive learning and the teaching of thinking skills.

Edwin S. Ellis, Ph.D.
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Dr. Ellis is a co-author of the Learning Strategies Curriculum. He currently is developing a manual on how to develop and implement a learning strategy intervention and two teachers' manuals, one addressing ways to increase students' reading comprehension from text and the other for teaching a strategic approach to point-of-view writing. His current research interests are in ways general education teachers can facilitate strategic learning in regular classroom settings.

Kevin Feldman
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Mr. Feldman, in his capacity as program specialist in the Riverside County Office of Education, is responsible for developing programs for teachers, parents, and students in regular and special education. He has served as a trainer with the University of Kansas' Strategy Intervention Model. Mr. Feldman also has an interest in cooperative learning, cognitive strategy use at the elementary level, and self-esteem and affective development.

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Ms. Fine currently is on professional leave from the Urbana School District. She is serving as a coordinator in Urbana for the University of Illinois Center for the Study of Reading Reciprocal Teaching Project. Her other professional interests include written language development in LD students, math problem solving, and computer assisted instruction.

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Dr. Graham has been involved in several studies designed to investigate the role of strategy instruction in improving the composition skills of learning disabled students. His current research interests include writing and strategy instruction.

Kathy Haagenson
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Ms. Haagenson is a teacher of seventh and eighth graders in the areas of English, reading, and social studies. She has participated in a project studying the use of interactive teaching strategies conducted by Candace Bos. Writing curriculum for use with regular and special education students and presenting staff development are among her current interests.

James Hargest
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Harford County Schools
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Mr. Hargest, along with Dr. Carolyn Wood, Supervisor of Research, Testing, and Evaluation for Harford County Schools, and other district staff members, contributed

to the development of two curricular guides that incorporate a learning strategies approach. Those guides are: *A Learning Strategies Approach to Functional Mathematics for Students with Special Needs* (1985) and *Teaching Writing to Students with Special Needs: A Learning Strategies Approach* (1988). Both Drs. Donald Deshler and Karen Harris served as consultants for the production of these guides.

Karen Harris, Ed.D.
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Dr. Harris has been involved in a series of studies validating self-instructional strategy training regimen among mildly to moderately handicapped learners in the areas of written language and mathematical problem solving. Her research interests lie in the areas of cognitive-behavior modification/cognitive strategy instruction, cognitive-behavioral assessment techniques, and self-regulation procedures effects on task behavior and academic learning among learning disabled children.

Beth Ann Herrmann, Ph.D.
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Dr. Herrmann's research interests are cognitive strategy instruction, cognitive assessment techniques, staff development, teacher metacognitive control of instruction, and effective instruction at the teacher education level. Recently, she has conducted reading and mathematics studies of the use of the direct explanation model of instruction and a series of studies focusing on the development of teachers' knowledge structures and interrelationships between teachers' knowledge structures and their instructional practice.

Michael F. Hock
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Mr. Hock has taught for 16 years, ten of them as a high school learning disabilities instructor. Since 1986, he also has served as a teacher trainer for the University of Kansas Institute for Research in Learning Disabilities Strategies Intervention Model. He has an interest in developing a strategy curriculum scope and sequence for mildly handicapped students in grades 5-12.

Clayton Keller, Ph.D.
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Dr. Keller taught behavior disordered students for eight years prior to starting his doctoral work in special education at the University of Virginia. He recently co-authored an article with John Wills Lloyd titled "Cognitive Training Implications for Arithmetic Instruction." Dr. Keller's current research interests are in the areas of learning disabilities in math, effective teaching for mainstreamed students, and subtypes of learning disabled students.

Pamela Knorr
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Ms. Knorr currently serves as a middle school reading specialist responsible for coordination of the school reading program. She has directed the reading instruction for the ESL and Severe ED Exceptional Needs Program and the reading staff development efforts for over 50 content area teachers.

B. Keith Lenz, Ph.D.
Institute for Research in Learning Disabilities
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Dr. Lenz's research interests are primarily in the area of interventions for adolescents at risk for school failure. Currently he is developing a series of books on the strategic delivery of content for use by regular classroom teachers. Dr. Lenz is serving as coordinator for a project designed to develop materials and training packages related to infusing the results of the Institute's work into college and university teacher training programs.

David Martin, Ph.D.
Dean, School of Education
Gallaudet College
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Dr. Martin is the Dean of the School of Education at Gallaudet College. He has been actively involved in researching the effectiveness of cognitive and metacognitive educational approaches with hearing impaired students. Dr. Martin also is concerned with developing models for infusing higher level thinking skills into the teacher education curriculum.

Cathy Mathias
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Ms. Mathias has taught for twelve years, ten of them in special education classes. She is the special education department chair at her school and serves on the district level special services advisory council. She has taught cognitive strategy instruction to learning disabled students at the middle school level.

Evelyn Maycumber
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Ms. Maycumber is the reading specialist for the eleven member districts of the North East Florida Educational Consortium. During the past school year she provided staff development to eleven pilot schools including demonstrations of effective learning strategies using the approach developed by Dr. Scott Paris of the University of Michigan. Her other interests include cooperative learning, process writing, and ways to empower students to take charge of their own learning.

Tina Miller
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Tina Miller is in her nineteenth editorial year in educational publishing and is currently executive editor for development of reading materials at D.C. Heath and Company. After graduating with a Bachelor of Arts in English from Colby College, her professional involvement in education began with a Peace Corps teaching assignment in Thailand. Graduate school at UCLA and teaching developmental/remedial reading in Florida and New Hampshire followed. Tina finds maintenance of the delicate balance among research, classroom, and business considerations the most fascinating challenge of educational publishing.

Annemarie Sullivan Palincsar, Ph.D.
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Dr. Palincsar is co-developer of the reciprocal teaching instructional procedure. She has conducted several studies of the effectiveness of this method primarily in the teaching of reading. Dr. Palincsar's research interests include the instruction of students with listening and reading comprehension problems and peer collaboration in problem-solving activities.

Michael Pressley, Ph.D.
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Dr. Pressley has written widely in the areas of children's learning, cognition and memory. He has served on the faculties of California State University at Fullerton, University of Wisconsin, Notre Dame University, and Max Planck Institute. In the fall of 1989 he will join the faculty of the University of Maryland. Dr. Pressley's current interests are in the areas of children's learning, cognition, and strategy development and use.

Taffy E. Raphael, Ph.D.
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Dr. Raphael is involved in research to expand our understanding of effective instruction in literacy. She is an author of the recently published basal reading series by Holt, Rinehart and Winston. Dr. Raphael's recent articles have appeared in *Reading Teacher*, *Exceptional Children*, and *Learning Disabilities Quarterly*.

Charles M. Reigeluth, Ph.D.
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Dr. Reigeluth recently joined the faculty of Indiana University after being associated with Syracuse University. He served as editor of the recent book *Instructional Theories in Action* and co-authored *Textbooks: A Question of Quality*, in the Phi Delta Kappa Fastback Series. His interests include instructional strategies for the acquisition of meaningful understanding; criteria for evaluating and selecting textbooks, courseware, and other educational resources; and prescriptions for the design of computer-based educational simulations.

Alan Sheinker, Ed.D.
Director of Research and Staff Development
Sweetwater County School District Number One, Wyoming
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Mr. Sheinker's responsibilities include coordinating district research activities, chairing curriculum committees, and directing and coordinating textbook adoptions. He is the Director of the Professional Development Center and site manager of the Leadership in Educational Administration Developmental grant. He is involved in a project to determine whether the effect of a metacognitive component to content instruction results in discernible improvements in content learning and metacognitive skills.

Jan Sheinker
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Ms. Sheinker's current responsibilities include administration of the Alternative High School and site supervisor of Carl Perkins Handicapped and Disadvantaged grants. She is involved in research to ascertain whether a metacognitive component to content instruction results in discernible improvements in content learning and metacognitive skills as compared to content instruction alone.

Linda Stevens
Publication and Training Consultant
Pennsylvania Resource and Information Center
for Special Education (PRISE)
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Ms. Stevens coordinates the production of a statewide newsletter, the "PRISE Reporter," which reaches 17,000 special educators. Recent issues of the newsletter focused on research on improving textbook usability and cognitive and metacognitive learning strategies. She, along with Ed Ellis, has delivered training for the Council for Exceptional Children in learning strategies as a part of the Academy of Effective Instruction. Currently, Ms. Stevens is pursuing her doctoral studies in the Department of Educational Psychology at the University of Minnesota.

Elizabeth Watson
University of South Carolina
Education Student

Ms. Watson is a student in the College of Education at the University of South Carolina.

Elena Dworkin Wright
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Before becoming an editor, Ms. Wright taught ED and LD children in private and public settings. As an editor, she has worked with researchers and practitioners to help promising curricula become published products. She worked with Beau Jones of NCREL, among others, in the production of *Insights-Reading as Thinking*, a basal alternative. Mastery Education's *Writing as Thinking* program is based upon the work of Stein and Trabasso, Britton, Graves, Scardamalia, Flowers, Hennings, Hillocks, and the National Writing Project.

Guests

Ed Gickling, Ph.D.
Assistant Executive Director for Professional Development
Council for Exceptional Children

Kathy Zantal-Wiener
Policy Specialist
Council for Exceptional Children

Cynthia Warger, Ph.D.
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Victor Fuchs
Director

Carol Bianchini Daniels
Associate Director

Charles Lynd
Information Specialist

Karen Scheid
Research Specialist

APPENDIX B
Sample Record from the ICSEMM Database

-TITLE-	OPEN COURT READING AND WRITING: THE COMPLETE BASAL READING PROGRAM
-AUTHOR-	Ann Brown, Joseph Campione, Carl Bereiter, Marlene Scardamalia, Valerie Anderson, Walter Kintsch
-FORMAT-	Print: complete K-6 basal series; basic materials include readiness kit, student readers, teacher's guides, teacher's resource books (includes worksheets, transparency masters, charts, posters, etc.); practice materials include workbooks and worksheets; supplemental materials include games, kits, cards, activity sheets, charts, and inservice videos; test and management materials include informal reading inventory, placement tests, unit tests, individual level test booklets, student and class record cards
-COST-	Moderately priced basal program; contact publisher for sales representative
-READING-	No readability formulas were applied; program uses "real literature" and publisher states that the stories selected are developmentally appropriate
-GRADE-	Ki,1.0,2.0,3.0,4.0,5.0,6.0
-INTEREST-	Ki,1.0,2.0,3.0,4.0,5.0,6.0

-DESCRIPTION-This basal program covers the full spectrum of the language arts, with special emphasis upon the integration of reading, writing, and language skills taught in the context of literature ranging from children's classics to contemporary authors and content-area reading of non-fiction selections. The use of formal learning strategies to develop skills is an integral part of the program, and the teacher's guide is designed, along with inservice videotapes (optional), to help teachers implement the use of the strategies. The Guide serves as a handbook for modeling the strategies taught in order to foster the development of independent reading skills.

Reading strategies employed include: setting reading goals and expectations, clarifying, summarizing, predicting, and asking questions. Writing strategies include: planning, setting writing goals, considering readers, using reading to improve writing, elaborating, and revising content. Study and research strategies taught include responding to new information and note taking.

Reading and writing skills covered include: listening and speaking skills, visual and auditory recognition, decoding (phonics approach), structural analysis, vocabulary skills, literature, reading comprehension, critical thinking, writing, grammar (usage and mechanics), and study and research skills.

Student reader-anthologies form the core of the program, which covers kindergarten

through grade 6. The program does not adhere to any reading level formula, but attempts to provide motivation through stories that are well illustrated and developmentally appropriate. Cooperative learning activities are encouraged, and slower and more advanced readers are asked to work together. The program emphasizes that slower students require a strong foundation of learning strategies. Lesson plans provide detailed suggestions for individualization, including enrichment for gifted students. The testing and management components provide diagnostic tests that are designed to assess both performance and the thinking process behind the child's answers.

-APPROACH- Learning strategies: reading, writing; whole language, cooperative learning

-EFFECTIVENESS- Field Test: The publisher states that this program incorporates the results of research conducted during the last ten years in the fields of reading, writing, teaching and learning. The program was pilot tested in classrooms for three years in 28 schools selected to represent a diversity of urban, suburban, and rural settings. More than 85 teachers and supervisors used the materials with 5300 students who represented a diversity of ethnic and racial backgrounds. Changes and recommendations made during the field trials were incorporated into the published edition. Formal and informal testing of the program continues. Selected school systems are being asked to evaluate students using the program with standardized tests (not Open Court's tests) administered at the beginning and end of the school year. Contact the publisher directly for additional information, including a list of schools that participated in the pilot test.

-PUBLISHER- Open Court Publishing Company

-ADDRESS- P.O. Box 599
Peru, Illinois
800/435-6850
800/892-6831 (in Illinois)

-ALPHA- Open Court Publishing Company

-SOURCE- Publisher brochures

-ACCESSION-

-CATALOG- 1989

-ALL- SPEDPROD

-END-

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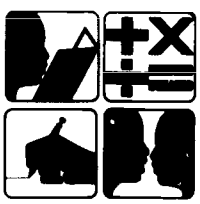

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