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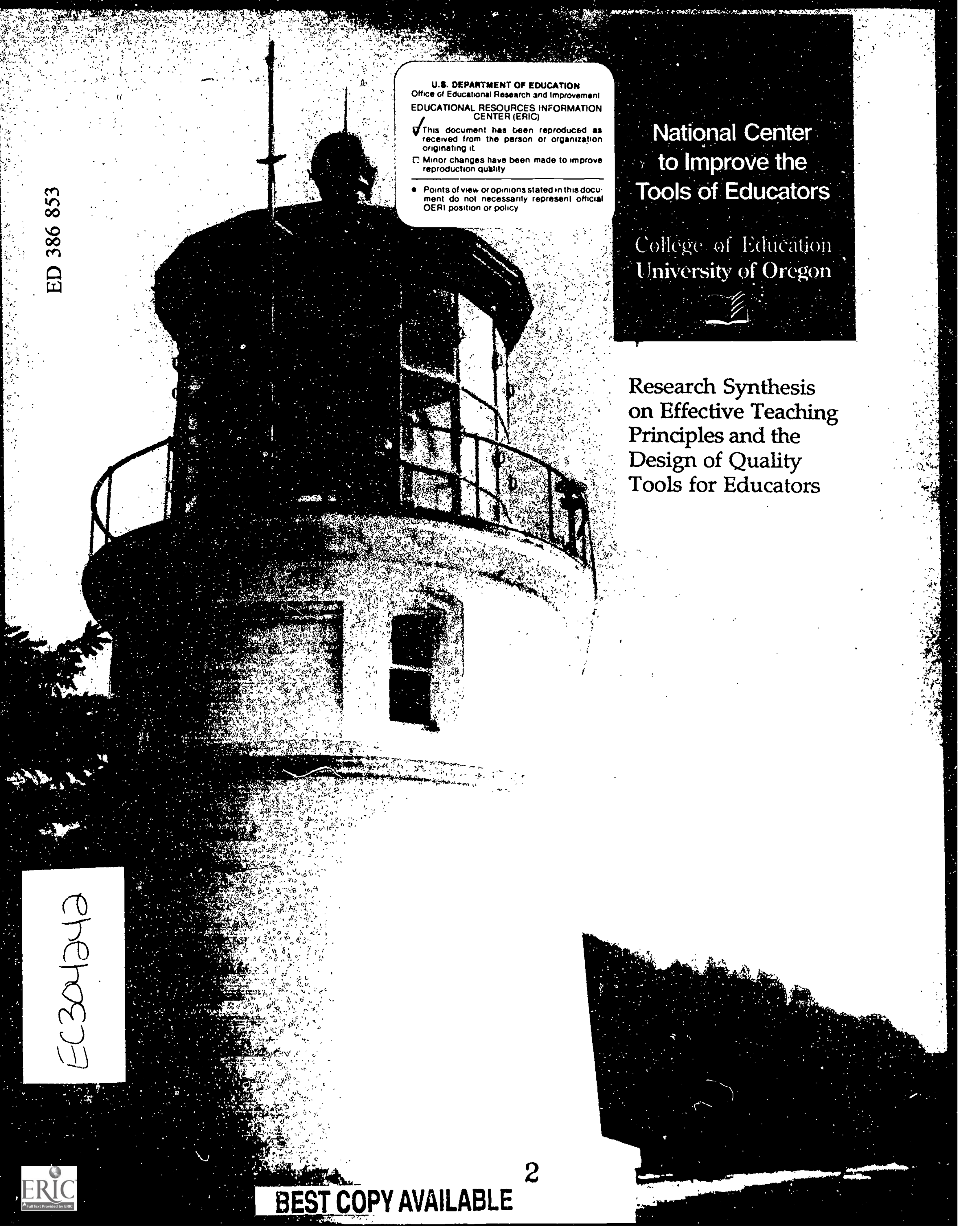
ABSTRACT

This monograph presents a synthesis of the literature on empirically supported effective teaching principles that have been derived from research on behavioral, cognitive, social-learning, and other theories. After an introductory section, the first section discusses characteristics of empowered and ineffective learners. Motivational, cognitive, academic, and social characteristics are identified. The next section provides an in-depth examination of 10 effective teaching principles. Each principle is explained in terms of an overview of research, definitions and examples of terms, overview of instructional approaches, and limitations and barriers. Principles addressed cover: (1) engagement time; (2) success rates; (3) content coverage/opportunity to learn; (4) grouping for instruction; (5) scaffolded instruction; (6) addressing forms of knowledge; (7) activating and organizing knowledge; (8) teaching strategically; (9) making instruction explicit; and (10) teaching sameness in the curriculum. The last section examines effective lesson structure and critical presentation techniques. It reviews such variables as modeling, verbal rehearsal, gaining attention of learners, goal-setting, practice, and the use of instructional organizers and then addresses teacher behaviors such as teacher questioning, managing student responses, pacing, and providing feedback. (Contains approximately 350 references.) (DB)



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Research Synthesis on Effective Teaching Principles and the Design of Quality Tools for Educators

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Research Synthesis on Effective Teaching Principles and the Design of Quality Tools for Educators

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Effective Teaching Principles and the Design of Quality Tools for Educators

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RUNNING HEAD: Effective Teaching

Effective Teaching Principles and the Design of Quality Tools for Educators

> [It is] "..very easy for science to be regarded as a guarantee that goes with the sale of goods rather than as a light to the eyes and a lamp to the feet"
>
> - John Dewey (1929, pp. 35-36).

Perhaps any endeavor to identify effective teaching principles based upon empirical research might best begin with a moment of reflection upon these words by John Dewey. Undoubtedly, as we near the end of the twentieth century, each of us probably is aware that we have participated in a century of humankind that knows no comparison. Living in an age of unparalleled scientific advances, the very core of all of our beings is immeasurably influenced by this zeitgeist in which we live. We begin this paper by paying credence to the profound notion set forth by Dewey, i.e., that the results of all our scientific endeavors are *no guarantee*. At best, they can illuminate us and guide us in our quest to improve our teaching methodology and practices. We *cannot* mechanically employ empirically-supported principles and techniques and thereby miraculously be transformed into "effective teachers." Teaching and learning are no less than human endeavors, and it is doubtful that any research study, or aggregation of studies, will ever capture that "humanness" which escapes and eludes the best of our scientific undertakings.

The last two decades will most likely become known as the "heyday of teaching technology" (Schuler & Perez, 1987). The very title of this paper reflects the extent to which technology has pervaded educational pedagogy. *"Tools?"* Quite a mechanical term, to say the least. One that most likely, has found its way only relatively recently into educational jargon... the connotation perhaps being that the tools we as teachers use serve to "repair or build" children? *"Principles?"* Embedded in this term, we perhaps might infer scientific laws... No doubt, for at least some, the very essence of this title conjures up considerable conflict. Do we *really* know what effective teaching is? Certainly, many would agree that its determination, has in large part, remained elusive to us. Though many an educator and researcher have tried to find the *One Best System* (Tyack, 1974) for effective teaching and schools, we've yet to find the perfect solution or formula for its realization.

Effective teaching, and by extension, effective student learning, has been the central focus of both historical and current educational reform movements. Within the last decade, we have witnessed a series of reform attempts through the publication of commissioned reports such as *A Nation at Risk*, (National Commission on Excellence in Education, 1983). Most recently, the six national goals set forth by President Bush reflect our society's concern about student achievement. In his 1990 State of the Union address, President Bush declared that the United States "lavishes unsurpassed resources on our children's schooling," and that "our focus must no longer be on resources... it must be on results." Strong and stinging words from a leader who wants to be known as "The Education President." Implicit in his words is the assumption that as educators we just "aren't doing enough."

For many, "rigor" has been advocated as an answer to educational woes. Jones (1986) and McCaslin and Good (1992) argue that two major solutions have been proposed via educational reform movements: (a) demanding more "rigor" in curriculum requirements, and (b) increasing the amount of time that students and teachers spend in teaching and learning pursuits.

Increased rigor, however, may not prove to be the key to improving our schools. Jones prognosticated that more rigorous academic requirements and a longer school year without sufficient attention to the *quality* of instruction will lead to even more failing students and will increase the segregation of high- and low-achieving students into curriculum options that respectively increase or limit their life opportunities; a phenomenon that has been well-documented and appears to most negatively impact our nation's poor and minority students (Epstein, 1980; Eyler, Cook, & Ward, 1982; Kulik & Kulik, 1982; Lietz & Gregory, 1978; Morgan & England, 1984; Rist, 1970; Rowan & Miracle, 1983; Scritchfield & Picou, 1982; Washington, 1982;).

Thus, it is with *quality* teaching in mind that we review and attempt to consolidate empirically-supported effective teaching principles that have been derived from research from diverse theories (behavioral, cognitive, social-learning, etc.). Through our research efforts, we have identified numerous broad-based principles that characterize what we know about effective teaching at the current time.

Following the section on principles are two additional sections: Critical Presentation Techniques and Effective Lesson Structures. All should be used, as Dewey (1926) noted, to guide and illuminate us. We encourage readers not to interpret these principles as "dictums" for educators to follow, but to use them as guides to either confirm or disconfirm personal beliefs about teaching (Fenstermacher, 1980). Though the autonomy of teachers appears to have been stripped both historically and at present (Goldman, 1989), as Berliner (1988) noted, it is the teacher who is the final arbiter of instruction. Once the classroom door closes and instruction begins, the teacher, as a reflective decision-maker, literally *is* the bridge between research and practice.

Consider the simple notion set forth by Jones, Palinscar, Ogle, and Carr (1987): "...a fundamental tenet of developing effective teaching methods is that instruction should reflect what is known about learning" (p. 3). Much of the effective teaching research conducted during the 1970s and 1980s was undertaken within a "process-product" approach (i.e., those *overt* teaching processes that increase student achievement) (Bryan, Bay, Sheldon, & Simon,1990). Process-product research is exemplified in the extensive studies conducted by researchers involved in the Beginning Teaching Evaluation Study conducted during the late 1970s and early 1980s. As noted by Powell (1980), the focus of this large-scale study was to identify and describe teacher variables related to student achievement. Such research involved considerable focusing on such observable variables as student engagement time, student-teacher interactions, grouping arrangements, content coverage, and the like.

Much of the more recent research on effective teaching and learning has focused on what are often *covert*, or inferred variables of student learning such as self-regulation, strategic thinking and learning, and information processing. Here the focus has been on the *internal* processes involved in student learning (e.g., the teaching of thinking) and how those processes are mediated by students and teachers. We have accumulated a wealth of research that has increased substantially our understanding of the processes involved in learning and thinking. Numerous fields of study (most importantly, cognitive, behavioral, and social-learning theories , neuropsychology, and computer technology) have contributed to this increased understanding. Given these new understandings of the teaching and learning process, efforts to reform educational seem timely.

approaches have substantial empirical support, and our research efforts, we hope, reflect an admixture of both.

While the research principles derived from process-product research are straightforward and readily understood, we thought it prudent to provide the reader with a brief overview of some of the underlying concepts of cognitive theory. Otherwise, we believe, some readers may be encumbered with both conceptualization difficulties and may be overwhelmed by the cornucopia of professional terms used in this field of study. Perhaps a useful manner in which to understand current research on cognition is to present an illustration of one child's approach to learning her weekly spelling words. Though lengthy, the following scenario illustrates much of what we currently understand about learning via cognitive research.

Each Monday, Leah, a second grader, is presented with a list of fifteen spelling words she is expected to master by Friday. Her teacher, Ms. Bellview, has established a standard weekly spelling routine. On Monday, she places the spelling words on flash cards, and spends from five to ten minutes drilling her class on recognition of each spelling word.

On Tuesday, students are expected to write each word five times each, whereas on Wednesday, they are to use each spelling word in a sentence. On Thursday, the class takes a practice test, and on Friday, the "real" spelling test occurs. Ms. Bellview believes that this routine provides her class with needed structure and consistency. Spelling, in Ms. Bellview's class, runs like clockwork.

Much more imaginative than her teacher, Leah routinely engages in several strategies to assist her in making at least a "B" each week in spelling. This week, Leah's spelling words are as follows:

three	week	tree	been	steel
seen	seem	seed	speed	fee
free	deep	beef	sweet	greet

A step ahead of her teacher, Leah already *recognizes* each the words, except for the word, "greet." When looking at this word on the flash card, she silently thinks, "Oh, that word is just like the word "green" except it has "t" at the end instead of "n. I can remember that! I just need to remember to think of the color "green" when I spell "greet".

During the flash card activity, Leah notices that each of these words contains "ee"." Upon this realization, she closes her eyes and visualizes the "ee" and says to herself, "On Friday, I must remember that every word has "ee."

Using her good phonetic skills in conjunction with listening to each word as it is said aloud, she gains yet another clue... each word has a long "e. "This is simple, they all have a long 'e' sound," she says. This triggers her memory of other similar words such as "bee" and "see." "Oh yes," she says to herself, "I remember those words... this is going to be easy this week!"

Inherent in reform is the notion that some things will be changed. Change, however, should occur through careful analysis of what we know (or at least think we know from our empirical research), about what works and what probably does not work. What we clearly should not do is *"throw the baby out with the wash"* or abandon instructional techniques that are well grounded both theoretically and empirically. Unfortunately, as noted by Yudof (1990), policy makers may be using public opinion to guide their actions without having carefully considered the host of complex variables that substantially impact upon student achievement. McCaslin and Good (1992) concluded that much of reform seems to centered around a "...false attempt to recapture a mythical past" (p.10). and House (1991) noted that we need to engage in "informed reform."

Perhaps one of the most valuable benefits of any educational reform movement is the intense self-evaluation of our practices that occurs. Inevitably, such critical reflection leads to dissatisfaction with the status quo. During the past twenty years, the status quo of teaching can be characterized primarily as reflecting a behavior orientation to the teaching and learning process where the teacher is viewed as having the primary responsibility of controlling what is to be learned, carefully manipulating the environment so that the desired stimuli is systematically presented, and motivating the student (i.e., "teacher-centered" instruction). More recently however, advances in research in cognitive and social science and student self-regulatory learning has led to numerous new instructional models (e.g., whole-language instruction, reciprocal teaching, cooperative learning, etc.) that are more "student-centered."

Unfortunately, many educators seem to view teacher-centered and student-centered paradigms as mutually incompatible - - that is, one must adopt either a teacher-centered behavioral approach or a student-centered cognitive approach. Our contention is that both behaviorist and cognitive theories have much to contribute in terms of effective teaching and learning, and we do not view these as mutually exclusive approaches (i.e., disclaiming one to proclaim the virtues of the other). As noted by Harris (1992), current cognitive theory represents a *blend* of numerous theories or learning. Heatherington and Parke (1986) also noted this blending and additionally emphasized the impact that computer technology has had in the development of cognitive learning theories. As we shall see, *research from both*

On Tuesday as she completes her "writing each word five times each" activity, she mentally underlines the "ee" in each word, reminding herself again to remember this on Friday. Also, Leah says each word to herself as she carefully and neatly writes each word (Ms. Bellview counts off for sloppiness). That night, she brings her list of words home, and her mother not only makes sure Leah recognizes each word, but also makes sure she understands their meanings as well. During this study session, her mother, Ms. Abrams, discovers that Leah does not understand the meanings of the words, "greet," "beef," and "week." Leah doesn't understand that the word "beef" is a categorical term for some foods she really enjoys (steak, hamburger, etc.). To assist her daughter, Ms. Abrams explains that the word "beef" is much like the word "fruit." Further elaboration occurs as Ms. Abrams explains that beef comes from cows just as ham and sausage come from a pig. Leah grasps these concepts quickly, and her mother proceeds to the next word, "greet." Realizing that Leah has no clue as to its meaning, Ms. Abrams suddenly and amusingly exclaims, "What's happening?" ... a favorite expression of Leah's. Ms. Abrams then continues to provide other examples and non-examples of greeting behaviors. Additionally, she helps Leah to understand the syntactical difference between "greet" and "greeting." To ensure that Leah fully understands the meaning of the word "greet," Ms. Abrams then asks Leah to give examples and to use the word in a sentence. Satisfied, Ms. Abrams moves on the word "week." She realizes that Leah has not discriminated the word "week" from its homonym, "weak." She writes both words for Leah, highlighting their spelling differences, and then proceeds to explain their differences in meaning. Leah understands the distinction well enough although she has to remind herself not to confuse the two when she writes her spelling words in sentences tomorrow.

On Wednesday, Leah sets about the task of sentence writing. As Ms. Bellview typically uses this time to grade papers, Leah, tired from physical education, tries to develop a strategy that will assist her in her task. She proceeds to neatly write her sentences as follows.

1. It is free.
2. It is deep.
3. It is beef.
4. It is a seed.
5. It is a tree.
6. It is a week.
7. It is steel.
8. It is sweet.
9. I have three.
10. I pay a fee.
11. I will greet you.
12. I have seen the show.
13. I seem happy.
14. My mom will speed.
15. I have been there.

Her strategy, of course, was to "get the job done" and "to get it done quickly and neatly"... important behaviors in Ms. Bellview's class.

On Thursday, Leah takes her practice spelling test. She does remember to include "ee" in each word. Leah correctly spells twelve of the words. She misses the words, "steel," "fee," and "free." She fails to include the "t" in "steel," and she confuses "free" and "fee." Sure that she can make a "100" on her test tomorrow, she takes her words home to her mother to study that night. Ms. Abrams, satisfied that her daughter can spell the remaining words, helps Leah design strategies to recall the other three words. They begin with the word "steel." Together, they make up the following rhyme:

S-T, you and me
E-E, happy as can be
and L - *please don't fail!*

They giggle as they repeat this rhyme over and over. Next, Ms. Abrams and her mother make up the following sentence:

Free pizza will cost a fee if you don't remember the "r."

Again, this sentence is repeated many times, and Leah is given several opportunities to practice spelling and discriminating the two words. With these strategies, Leah feels confident about her spelling test tomorrow.

We believe most people, upon reading this scenario, would conclude that while Ms. Bellview is doing very little to promote her students' learning, both Leah and her mother are engaging in numerous strategic, mediational learning activities. This scenario highlights the *active* role learners play in their own learning; a basic tenet of cognitive processing approaches. Typical cognitive processing models, such as those offered by Atkinson and Shriffin (1968) and Swanson (1987), describe the learning process as follows: (a) information from the environment is perceived and attended to by the learner; (b) the information is then transferred to short-term memory, roughly analogous to a mental work space; (c) the information is acted upon by the selection of pertinent rules, procedures and strategies; and (d) each of the previous three processes are controlled by an executive mental function (i.e., an orchestrating function which assists the learner in perceiving, attending, activating prior knowledge, selecting problem-solving strategies, and monitoring the success of solutions to problems; i.e.., *self-regulatory* behaviors). In the spelling scenario, we see Leah engaging in each of these processes. She attended and perceived the relevant aspects of her spelling task, activated her prior knowledge of rules (e.g., the digraph "ee" and the long "e" sound) and strategies (e.g., mentally underlining the "ee" as she wrote her words five times each).

A central concept of cognitive processing theory is that the executive or control function involves three processes: *rehearsal* (repetition of information), *organization* (i.e., ordering, classifying, tagging information for future retrieval), and *mediation* (comparing new information with previously learned information). Swanson and Cooney (1991) described several organizational strategies: (a) chunking (i.e., groping items so that each one brings to mind a series of items), (b) clustering (forming categories), (c) mnemonics (idiosyncratic methods of organization), and (d) coding (varying the form of information, such as imagery). Mediation, according to Swanson and Cooney (1991) is facilitated by (a) making associations with previously learned information, (b) utilizing instructions to aid in retrieval and organization, and (c) cueing through verbal or imaginary information. Leah used each of throughout the week.

In our scenario, we see that Leah engaged in all three control or executive function processes (i.e., rehearsal, organization, and mediation). She *rehearsed* as she wrote her words five times each, mentally underlining the "ee" in each word. She *organized* information into categories (i.e., the "ee" association and the long "e" sound), and she mediated her learning by making several associations with prior knowledge (e.g., recalling the words "bee" and "see"; visualizing the "ee" in each word). More specifically, components of her organization processing included clustering (e.g., she grouped words by the "ee" digraph; grouping was evident when she and her mother discussed the meanings of "fruit," "beef," and "pork"; her simplistic approach to sentence writing reflects an understanding of nouns and verbs), mnemonics (e.g., the rhyme developed to help her remember how to spell "steel."), and coding (thinking of the color "green" when spelling "greet"). Mediating processes in which she engaged included activating prior knowledge (e.g., when she and her mother built upon her concept of "fruit" to assist her in understanding the concept of "beef" and also, when the two related Leah's favorite greeting expression to the spelling of "greet."), she utilized self-instructions to help her remember that all words had an "ee" in them, and her mother helped her cue herself by rehearsing a meaningful sentence to assist her to remember the "r" if "free."

Leah's behavior is characteristic of empowered and effective learners. As we shall see in the following section of the paper, empowered learners employ many strategies to mediate their learner. Current research has shown that ineffective learners do not spontaneously generate these mediating strategies. As a result, their learning is negatively impacted.

Characteristics of Empowered and Ineffective Learners

As Ellis and Friend (1991) noted in reference to adolescents with learning disabilities, "... the natural tendency is to focus on the limitations and problems of these individuals and then view these characteristics as if they were *unique* to the learning disabled condition" (p. 506). Such a statement is true of almost *any* disabling condition. By adopting this "within-child" deficit approach, educators may be unwittingly ignoring critical environmental factors that contribute to school failure. Thus, educators may better serve students by adopting a more holistic approach which acknowledges this dynamic interaction. When we begin to intervene with students holistically, we recognize the reciprocal nature between learning and teaching. Fortunately, current research (cf. Ellis, 1992; Ellis & Friend, 1991) has suggested that the manipulation of both learning and teaching variables can greatly improve student learning. While this section is devoted to delineating the characteristics of learners, the remainder of this paper focuses on those teaching and learning (i.e., environmental) variables that can be manipulated to improve student learning. By incorporating effective teaching principles, presentation techniques, and implementing effective structures into their lessons, teachers can assist students in becoming independent and self-regulatory; a goal that will "empower" students to become self-sufficient, productive citizens. Thus, it is the goal of "empowerment" of all learners for which educators should strive.

Ellis (1992) noted that although the concept of the "empowered student" represents the ideal, this conceptualization provides a viable way of addressing the needs of *all* students, whether they be high-achieving or low achieving. In essence, we should endeavor to assist students to achieve this ideal to the maximum extent possible. Successful learning, Ellis maintained, can be realized through the *empowerment* of students. This view of empowerment, he asserted, is based upon a wealth of research regarding the learning styles and personalities of successful learners and also from results derived effective teaching and learning research.

The bulk of expert-novice research has provided much information regarding the characteristics that distinguish the expert from the novice (or ineffective) learner. In general, experts differ from novices primarily in their ability to *regulate* and *monitor* their own behavior in terms of motivation, socialization, academic, and cognitive demands. These inabilities result in diminished student learning. The critical differentiating dimensions/characteristics identified below highlight the major findings from this research. It is along these critical dimensions that experts and novices (or ineffective learners) differ. Rather than accentuating what the novice or ineffective learner *cannot do*, we have chosen to take the more positive stance by describing the empowered learner. In other words, the ineffective learner typically *does not* possess many of the characteristics of the empowered learner as identified below. Therefore, when reviewing the characteristics of the empowered learner, the reader should be aware that the opposite often holds true for the novice or ineffective learner.

Motivational Characteristics of the Empowered Student

1. *Empowered students have an internal locus of control.*

   Empowered students rely on their own abilities to direct their behaviors. They are self-initiating, and they do not rely on others for guidance and structure. However, they recognize when assistance is needed. If necessary, empowered students will seek assistance and incorporate it into their own self-directed problem-solving regime. These students, however, feel ultimately responsible for their own behavior and are motivated by this responsibility.

2. *Empowered students expect to be successful.*

   Empowered students expect to be successful when confronted with tasks in the present. They also view their future as personally successful ones. When successful on tasks, empowered students attribute their successes to their own efforts and abilities. Empowered students believe that self-improvement is possible and are continually motivated toward this end. They believe in their own abilities that they are willing to take risks in order to expand learning.

3. *Empowered students are goal oriented.*
   Empowered students establish both long- and short-term learning goals. They are adept at setting short-term goals that will enable them to meet their long-term goals. When approaching tasks, empowered students set two types of long-term goals. First, their goal is to *regulate and monitor* their own progress toward goals. Second, their goal is to understand the task-at-hand and to deliberately understand *what* it is important and *how* it will extend their knowledge. Empowered students also have *substantive* goals such as trying to understand a plot in a story and *strategic* goals such as learning how to compare characters in a story.

   Empowered students are goal-oriented in the sense that a significant part of their motivation originates from their *fascination* with new information. They actively interact with information (e.g., making different connections to prior learning). They view learning as an opportunity to be stimulated and are motivated by this stimulatory goal.

4. *Empowered students are invested in the learning process.*

   Students who are empowered are *intrinsically motivated.* Although they realize that they must meet the academic expectations required in school, they are more *self-motivated* in the sense that the act of learning is the *primary* motivating reason for completing tasks. Because they are intrinsically motivated, these students exhibit tenacity on difficult tasks, employing self-coping strategies that assist them in accomplishing the tasks.

Empowered students are *self-reinforcing*. That is, they frequently congratulate themselves for doing well on tasks, and they employ self-reinforcement techniques that assist them in completing difficult tasks.

Cognitive Characteristics of Empowered Students

Ellis (1992) believes that empowerment is not limited to those students with high intellectual ability. Indeed, in his review of research, he concluded that at least *some* aspects of intelligence are modifiable through training , individual effort, and effective problem-solving. His view of empowerment concerns those characteristics that are *within an individual's control*. Generally, the maintained that empowered students are good at controlling their information processing. That is, they deliberately *regulate* their thinking, and their approach to learning is *strategic*. Three cognitive characteristics of empowered learners have been identified by Ellis:

1. *Empowered students actively use prior knowledge and skills to gain new knowledge and skills.*

   Empowered students *actively* processes information by making associations with prior knowledge (i.e., schema building). These schemas are highly interrelated and are continuously modified as new learning occurs. Not only do empowered students activate prior knowledge to assist them in assimilating new knowledge, but they also access prior *strategic* knowledge as well. Learning strategies that have been successful in the past are used to solve present learning problems. An empowered student will analyze a current problem to determine its similarity to problems solved in the past. Empowered students recognize *when* there is a problem, and they are *proactive* in taking actions to solve current learning problems.

2. *Empowered students actively work to organize knowledge.*

   As new information is encountered, empowered students *structure* information so that can be understood and learned. Examples of information structures which empowered students use include comparing and contrasting, determining cause and effect embedded within text structure, and using other contextual clues to assist them in solving problems.

   Another way in which information is organized is the determination of genre, or determining the type of information that is being processed. For example, text genres include science fiction, fairy tales, biographies, and exposition. Information can be organized by recognition of the text genre. Depending upon the text genre, empowered learners process information differentially.

   Empowered students have *internalized* and *well-integrated* knowledge regarding information structures and genre. They are constantly creating *complex* organization structures and they restructure them to accommodate new information.

3. *Empowered students actively work to self-regulate their thoughts and actions.*

Empowered students have an *array* of cognitive skills and strategies, and know *how* and *when* to use them when solving learning problems. They know *why* they should be used, and they actively *control* their efforts to use them. These students are *reflective* about selecting the best strategies to attain their learning goals. They actively *monitor* their own learning and performance, and they use their skills and strategies *dynamically* and *flexibly*. Empowered learners recognize when a strategy or skill is needed that they do not possess, and they are proactive in their efforts to acquire the needed skill or strategy to assist them in learning.

Academic Characteristics of Empowered Students

Empowered students view the acquisition of academic skills as avenues that will enable them to become more *independent*. Because they view learning from this perspective, empowered students may expend considerable energy in understanding *why* they are learning something and *how* it will help them become more self-directed (Ellis, 1992; Jones, Palinscar, Ogle, & Carr, 1987).

1. *Empowered students possess a broad array of academic skills and strategies.*

Empowered students possess three types of academic skills and strategies: (a) those necessary for *acquisition of information* (i.e., skills and strategies for reading textbooks, listening to lectures, conducting library research) in order to gain new knowledge), (b) those necessary to facilitate the *storage of information* (i.e., skills and strategies necessary for storing information in the form of permanent products [e.g., outlining, notetaking] or in memory [e.g., mnemonic devices), and (c) those skills and strategies necessary to *express of demonstrate competence* (e.g., taking tests, writing as essay, making an oral presentation, completing a lab experiment).

2. *Empowered students use their academic skills and strategies flexibly and interchangeably.*

Empowered students carefully analyze the nature of the task, and develop a strategic plan for a completing the task, and monitor and evaluate their progress. Strategies are used flexibly and interchangeably across tasks. For example, a student may employ a specific writing strategy when completing a creative writing assignment or writing a scientific report). They are knowledgeable about general task-specific strategies that are both effective and efficient and use these general strategies across academic settings.

3. *Empowered students have acquired extensive knowledge about important concepts* (Pressley, Borkowski, & Schneider, in Ellis, 1992).

As noted by Ellis (1992), empowered students, by virtue of the investment in learning, acquire over time extensive knowledge bases that facilitate the acquisition and assimilation of new information. For example, an empowered student may have acquired such an extensive knowledge base of the Civil War that she or he may understand the *implications* of the Lincoln's Gettysburg address rather than simply memorize the fact that Abraham Lincoln *made* the Gettysburg address. Additionally, empowered students, because they are stimulated by the acquisition of new knowledge constantly place themselves in positions to gain new knowledge even outside the school context (e.g., they read newspapers and thought-provoking novels and socialize with friends who share their investment in learning).

Social Characteristics of Empowered Students

1. *Empowered students are socially strategic.*

Glenn and Nelson (in Ellis, 1992) noted that empowered students have three critical perceptions or beliefs about themselves. First, they perceive themselves as *capable* individuals. That is, they have a sense of personal competence and ability. They are aware of both their strengths and weaknesses and accept these as such. Second, empowered students have sense that they are *significant* (i.e., they sense that they are accepted by others and make contributions to others). Finally, empowered students perceive that they have *influence* or some power to shape or control what happens to them. These beliefs are reflected and manifested in the skills and strategies they employ in social settings. Glen and Nelson (in Ellis, 1992) maintained that these three personal beliefs are the building blocks for social empowerment in four key areas:

a. Empowered students possess effective and efficient *intra-personal* skills and strategies.

Empowered students have the ability to understand both their emotions and those of others. These perspective taking skills assist them in selecting the most appropriate social strategies when interacting with others.

b. Empowered students possess a broad array of *inter-personal* skills and strategies.

Empowered students adeptly "read" social situations and are able to develop or access appropriate social strategies during social interactions. For example, empowered students are able to successfully negotiate with others when conflict arise.

c. Empowered students possess *systemic* skills which they use to respond to the limitations and consequences of daily living with responsibility, adaptability, flexibility, and integrity.

Empowered students understand that society imposes certain limitations upon all individuals and that violation of these limitations entails consequences. For example, empowered students understand the necessity of school rules for social order and understand the rationale beyond the consequences when school rules are broken. They also readily understand that some behaviors are acceptable in some situations but not in others. For example, rambunctious behavior may be acceptable in the locker room, but not in class.

d. Empowered students posses good *social judgment* skills.

Because empowered students are reflective thinkers, they evaluate social situations and make good decisions accordingly. When their decisions prove unwise, they take responsibility for their decisions and learn from their experiences.

2. Empowered students recognize that *learning is a social phenomenon* and that learning is a generative process that happens between those who want to learn (Gibbs, in Ellis, 1992).

Empowered students feel supported by their peers and support their peers in the learning process in return. Empowered students spend their time actively honing their processing skills with both those who have greater wisdom and with those with less wisdom (Johnson & Johnson, in Ellis, 1992). Empowered students recognize the benefits to be reaped by sharing their information and skills with others.

Overview of the Effective Teaching Principles

This section of the paper is designed to provide an in-depth review of fifteen areas of research on effective teaching (see next page for an overview). The order of the principles are loosely hierarchical in nature. That is, principles were organized so that concepts, terms, etc. generally build upon one another. Principles are presented in a self-contained fashion to permit a more coherent organization of the paper although the content of some principles overlap at times. Each effective teaching principle is divided into the following sections.

A. Overview of Research

Generally, this section provides a review of research that supports the principle. Embedded within the overview are illustrations of specific instructional techniques and methods based upon the principle. For example, the principle related to scaffolded instruction provides a brief discussion of Reciprocal Teaching.

B. Definitions and Examples of Terms

Essential terms are defined, and examples of concepts and terms associated with each principle are provided.

C. Overview of Instructional Approaches

Though not a section included in the discussion of every principle, a more in-depth review of instructional principles is provided for some principles, as appropriate.

D. Limitations and Barriers

In each review of effective teaching principles, potential limitations and barriers are identified. Essentially, this section addresses those potential barriers that could prevent the bridging of research and practice.

Note: A comprehensive list of references are provided at the conclusion of this paper.

EFFECTIVE TEACHING PRINCIPLES

Principle 1: Engagement Time	**Principle 2:** Success Rates
Principle 3: Content Coverage/ Opportunity to Learn	**Principle 4:** Grouping for Instruction
Principle 5: Scaffolded Instruction	**Principle 6:** Addressing Forms of Knowledge
Principle 7: Activating and Organizing Knowledge	**Principle 8:** Teaching Strategically
Principle 9: Making Instruction Explicit	**Principle 10:** Teaching Sameness in the Curriculum

Engagement Time

Principle 1: *Students learn more when they are engaged actively during an instructional task.*

Overview

When planning instructional activities, time should be considered as an important instructional principle. Fisher, Marliane, Cahen, Dishaw, Moore, and Berliner (1980) identified three aspects of time that directly impact on student learning: (a) the maximum amount of time that is allocated for the activity; (b) the degree to which students are engaged during allocated time; and (c) the degree to which the students engage in the activity at a high rates of success. Results from the Beginning Teacher Evaluation Study ([BTES], in Denham & Lieberman, 1980) have provided considerable empirical evidence that each of these three aspects of time is directly and positively related to student learning outcomes.

Results from the BTES time studies and others (cf., Kindsvatter, Wilen, & Ishler, 1988) have indicated that the amount of allocated time devoted to specific content varies considerably from classroom to classroom. Additionally, Rosenshine (1980), in summarizing the results of the BTES, reported that students spend approximately 58% of the school day on academic activities, 23% of non-academic activities (e.g., music, art, physical education), and 19% on non-instructional activities (e.g., transition and break times, lunch). Generally, average student engagement rates during an instructional activity are reported to range from 60% to 75%. However, much variability of task engagement rates across classrooms (average rates have ranged from 30% to 90%) has been observed (cf., Kindsvatter, Wilen, & Ishler, 1988).

Many time studies have included success rate as a critical variable. Results from these studies (BTES, in Block, 1980) have indicated that high, moderate, and low success rates have a differential impact on student learning. The BTES (in Block, 1980) provided evidence that when students are provided with high rates of success during instructional activities, the potential for student learning is increased (for additional information, refer to Instructional Principle 2 on success rates).

On the average, students appear to spend approximately two-thirds of their allocated time in seatwork activity, and approximately one-third of their time is spent in direct instruction (BTES, in Rosenshine, 1980). Student task engagement rate appears to be increased when activities are directed actively by the teacher (BTES, in Rosenshine, 1980).

Despite the many criticisms that have been levied against seatwork, the BTES (in Rosenshine, 1980) indicated that seatwork activities are usually meaningful, and task engagement during seatwork may be optimized when the teacher interacts substantively with students. There is some evidence, however, that when seatwork activity is excessive, student engagement may decrease (BTES, in Rosenshine, 1980; Rosenshine & Berliner, 1978).

Teachers use allocated time differently. Research has suggested that effective teachers spend 15% less time on management and organization tasks, and 50% more time in interactive activities.

Additionally, effective teachers organize their time so they can spend at least some time with the total group, in small groups, and with individuals (cf., Borg, 1980; cf., Kindsvatter, Wilen, & Ishler, 1988).

Definitions and Examples of Terms

Allocated Time	The maximum amount of time designated for a student to learn specific content or a specific skill (Fisher et al., 1980). *Example*: The amount of time allotted for all reading activities or for a specific decoding activity.
Engaged Time	The amount of allocated time a student spends participating in a task or attending to instruction (Fisher et al., 1980). *Example*: The amount of time a student participates in, or attends to, a specific decoding activity.
Academic Engaged Time	The amount of allocated time a student spends engaged in a task that s/he can perform with a high rate success (Fisher et al, 1980). *Example*: Student completes a decoding activity worksheet with 90% accuracy.
Substantive Interaction	Interaction characterized by questioning, answering, providing corrective feedback or explanations (Rosenshine et al., 1980). *Example*: When engaging in a decoding activity, student-teacher interactions are characterized by frequent questioning and answering, provision of examples and non-examples, corrective feedback, and a thorough presentation/explanation of the decoding skill(s).

Limitations/Barriers to Effective Use

1. Teachers may be limited in their ability to plan and control allocated time. Dictates from administrators may require that specific amounts of time be allocated by content area. Additionally, individual school district administrations may require that a specific amount of content be covered during the school year. Efforts to include teachers in the decision-making process regarding time allocations in school may help reduce these time limitations.

2. Teachers may be limited in their ability to control managerial and organizational tasks. Attendance and lunch reporting along with other paperwork activities may impede their efforts to control time. Administrators and teachers alike need to work collaboratively and creatively in preventing managerial tasks from intruding upon instructional time.

3. Environmental barriers (e.g., physical arrangement of the classroom) may preclude the provision of a variety of instructional methods (e.g., large, small, and individual groupings; class size may limit the extent to which teachers may assess and individually plan activities). Environmental barriers may be reduced when administrators and teachers collaboratively seek solutions to environmental barriers.

4. Matching student to appropriate activities requires specific education/training in assessment to determine student needs. Inservice education, along with higher education, may need to be provided to enable teachers to implement a successful, effective assessment program.

Limitations/Barriers to Effective Use (continued)

5. Teachers may not have the expertise needed to implement substantive interaction (e.g., questioning and probing skills may be limited) and may need additional preparation in this area.

6. Teachers may need additional education in providing adaptive, individualized instruction. Such an approach necessitates that teachers be aware of, and implement effectively, methods and materials appropriate to the student's needs. Again, additional inservice may be needed to alleviate this potential barrier.

Levels of Success/ Success Rate

Principle 2: ***High success rates (and to a less certain extent, moderate success rates) are correlated positively with student learning outcomes, and low success rates are correlated negatively with student learning outcomes.***

Overview

When planning instruction, the rate of success at which a student completes a task should be considered as a critical instructional variable. Results from the Beginning Teacher Evaluation Study ([BTES], in Fisher, Berliner, Filby, Marliave, Cohen, & Dishaw, 1980) and other studies (Anderson, Evertson, & Brophy, 1979; Block, 1970; cf., Englert, 1983; 1984a; 1984b; cf., Fisher, Marliave, & Filby, 1979; cf., Rieth & Everston, 1988; Kindsvatter, Wilen, & Ishler, 1988; cf., Powell, 1979) have indicated that high rates of success (and to a less certain extent, moderate rates) are positively related to learning outcomes. Conversely, low success rates are negatively associated with student learning outcomes. As noted by Berliner (1988), results from the BTES have provided convincing evidence that there is a considerable, positive relationship between high success rate and achievement. Additionally, Berliner maintained that high success rates (or almost errorless performance) are especially critical to increasing student achievement among younger students and ineffective learners.

This instructional principle, as addressed by Block (1980) assumes that *all students can master a subject given sufficient time and appropriate instruction.* Block argued that if our schools are to increase student learning, then more direct and concentrated efforts toward providing "errorless" learning should be undertaken. This principle, explicit in Bloom's (1968) mastery learning approach, necessitates that teachers routinely engage in the following activities: a) diagnosis; b) prediction, c) orientation, d) feedback, and e) correction (BTES, in Block, 1980; Hudson, Colson & Braxdale, 1984). Though not without criticism, mastery leaning, as an instructional approach, has received considerable support for increasing student achievement, improving students' interests, attitudes toward subject matter, and self-concept (Block and Burns, 1976; Fuchs, Fuchs, & Tindal, 1986; Guskey & Gates, 1986; Rosenshine & Berliner, 1978; Stallings & Stipek, 1986). Other approaches that incorporate features of mastery learning which have received empirical support for increasing student achievement via the careful monitoring of student success rates include Direct Instruction (Carnine, 1980; Englert, 1983; 1984; Gersten, 1981; 1985; Peterson, 1979) and Precision Teaching (Binder, Haughton, & Van Eyk, 1990; Koorland, Keel, & Ueberhorst, 1990; Lindsley, 1990; Mercer, Mercer, & Evans, 1982; White, 1986).

Overview (continued)

A careful content match between student level of achievement and task assignment appears essential if high student success rates, and thereby improved learning outcomes, are to occur (Adelman & Taylor, 1983; Brookover, Beady, Flood, Schweitzer & Wisenbaker, 1979). Brophy (1979) and Rosenshine (1983) reviewed numerous studies which indicated that academic tasks that are individualized according to student needs result in high success rates. In general, they concluded, effective teachers: a) move students at a brisk pace; b) present content in small steps; and c) provide academic tasks that are mastered easily by most students.

The range of success within a classroom may vary considerably. Results from the BTES (Fisher et al., 1980; cf., Berliner, 1988) indicated that success rates in second-grade reading classrooms ranged from students who completed only 9% of their tasks correctly to students who completed 88% or more of their tasks correctly. Similar success rates in math classrooms were observed by Squires, Huitt, and Segars (1983).

Although there are no data that support absolute percentages for high and moderate rates of success (Reith & Evertson, 1988), Levin and Long (1981) recommended that a 70% to 80% success rate is acceptable *if* that rate of success indicates that a student has achieved the major content objectives. Brophy and Evertson (1976), Rosenshine (1983), and Stephens (1976) recommended that students be able to complete tasks at a 70% to 90% success rate when under the direct instruction of the teacher or when engaging in initial learning activities. During independent activities, instructional tasks should promote even higher success rates (i.e., 90% - 100%).

Rosenshine (1983) stressed the need for younger and ineffective learners to engage in tasks at a success rate that results in overlearning. He emphasized that basic skill acquisition is taught hierarchically, and consequently, success at any level requires application and knowledge of the skills previously learned). Stevens and Rosenshine (1981) emphasized that it is *correct* and *rapid* responses that correlate highly with student achievement.

Students with mild disabilities may be especially prone to be exposed to content that results in low success rates. Rieth and Frick (1983) reported that students with mild disabilities experienced 43% high task success, 45% medium task success, and 12% low task success. In contrast, Fisher, Berliner, Filby, Marliave, Cohen, Dishaw, and Moore (1978) observed relatively higher rates of success in general education classrooms (2nd and 5th grades): 45% high task success, 53% moderate task success, and 3% low task success. As noted by Reith and Evertson (1988), students with mild disabilities may require more precise and continuous assessment of academic skills in order to increase the potential for high success rate.

In addition to increased academic achievement, successful experiences on tasks positively relates to internalized student attributions of success (e.g., personal ability and effort) (Anderson, Stevens, Prawat, & Nickerson, 1988; Aponik & Dembo, 1983; cf., Dweck & Goetz, 1978; Frieze & Weiner, 1971; Jacobsen, Lowery, & DuCette, 1986; Stipek, 1988). Students who experience frequent failure tend to attribute their success to other external factors (e.g., luck, task ease). Children who experience frequent failure, may over a period of time, exhibit behavioral characteristics associated with "learned helplessness" and may engage in task avoidance behavior (Adelman & Taylor, 1983; Thomas & Pashley, 1982).

Definitions and Examples of Terms

BTES researchers (as reviewed by Block, 1980) defined three success rates as follows:

High Success Rate	The rate at which a student spends time on tasks and finds the tasks quite easy ; tasks at a level at which the student can easily master the material. *Example*: Student completes an addition worksheet with 90% accuracy.
Moderate Success Rate	The rate at which a student spends time on tasks and finds the tasks somewhat easy; tasks at a level which the student can master only part of the material. *Example*: Student completes a subtraction worksheet with 60% accuracy.
Low Success Rate	The rate at which a student spends time on tasks and finds the tasks very hard; tasks are at a level at which the student encounters difficulty mastering the material (BTES, in Block, 1980). *Example*: Student completes a silent reading comprehension activity with 10% accuracy.
Competitive Goal Structure	An instructional arrangement in which students work against each other to achieve a goal that only one or a few students may obtain (p. 3 in Andersen, Nelson, Fox, & Gruber, 1988). *Example*: Only one student is declared the winner in a spelling bee.
Individual Goal Structure	An instructional arrangement where students work independently to accomplish individual goals (Andersen, Nelson, Fox, & Gruber, 1988). *Example*: In a mathematics class, one student works on addition, another on subtraction, another on multiplication, etc.
Cooperative Goal Structure	An instructional arrangement in which students are grouped heterogeneously and work together to accomplish a common goal (Andersen, Nelson, Fox, & Gruber, 1988). *Example*: In a study of the westward movement, one group of students work on a transportation project, , another on a pioneer clothing project, another on gold discoveries, etc.

Definitions and Examples of Terms (continued)

Success Attributions

The causes one assigns (either externally or internally) to successful or unsuccessful performance (Jacobsen, Lowery, & DuCette, 1986).

Example: A student assigns his/her success on a task to luck (an external success attribution), not effort or ability (internal success attributions).

Learned Helplessness

A syndrome in which a student fails to... "perceive the connection between one's actions and desired outcomes" (Thomas & Pashley, 1982, p. 133). Characteristics of children who exhibit this syndrome include anxiety, an unwillingness to attempt ability-appropriate tasks, low task frustration levels, and poor problem-solving ability (in Thomas & Pashley, 1982).

Example: Even though a student has previously demonstrated mastery of basic multiplication facts, s/he refuses to attempt a task of this nature because s/he believes the task is too difficult.

Overview of Effective Instructional Approaches

Mastery Learning

Systematic instructional approaches that include the following teaching activities:

a) *diagnosis* - i.e., accurate predicting a student's future performance based upon present and past performance;
b) *prescription* - providing appropriate tasks for a student based upon the diagnosis;
c) *orientation* - clarifying each learning task for a student (i.e., what is to be learned and how it is to be learned);
d) *feedback* - consistently providing information to the student regarding his/her progress on a task; and
e) *correction* - providing supplemental instruction for a student when insufficient learning occurs (Block, 1980).

Direct Instruction

A set of teaching behaviors that include: a) making goals clear to students; b) allocating time for instruction that is both sufficient and continuous; c) extensive content coverage; d) continuous monitoring of student performance; e) asking questions at a cognitive level that will result in many correct responses; and f) providing immediate academic feedback (Rosenshine & Berliner, (1978).

Overview of Effective Instructional Approaches (continued)

Precision Teaching	An instructional strategy based upon operant conditioning which incorporates the methods of experimental analysis. Elements of precision teaching include: a) an emphasis on direct measurement and continuous monitoring; b) use of rate of response (e.g., number of correct math problems per minute) is the index of measurement; c) the use of operationally defined student behaviors; d) continuous analytical investigation to determine environmental influences on student learning; and e) a focus on increasing appropriate behavior (e.g., through successive approximations) rather than eliminating inappropriate behavior (e.g., punishment) (Lindsley, in West, Young, & Spooner, 1990).

Limitations/Barriers to Effective Use

Ensuring that students engage in their academic tasks at high success rates may be difficult for a variety of reasons: a) administrative barriers; 2) environmental barriers; 3) diverse student problem-solving styles; and 4) lack of teacher knowledge and skills. Each of these variables may occur in isolation, or interact together, to decrease student success rate, and ultimately, impact negatively upon student achievement.

1. *Administrative Barriers*

Pressure placed on administrators for both higher standards and minimum competency testing may prohibit the provision of content that promotes high student success rate and levels of task engagement. Administrative directives may place pressure on teachers to cover content that may not be conducive to the realization of high rates of student success. Such pressures may result in administrative decisions that prevent teachers from planning and implementing curricular activities appropriate to the individual needs of their students. Thus, curricular decisions, such as the type of content covered, the instructional materials to be used, and instructional arrangements may be administrative decisions that preempt a teacher's control over student success rates. Brophy (1982) in a review of research studies conducted at the Institute for Research on Teaching at Michigan State University, suggested that many curricula decisions (e.g., establishing educational objectives, preparing curriculum materials, evaluating learning outcomes) appear to be largely determined by administrators, school boards, or commercial publishers. Consequently, teachers may be limited in their in their capacity to provide content to students that results in high student success rates.

To ensure an appropriate instructional student match that will result in high success rates for students, direct and frequent assessments are required. These assessments may be time-consuming, and unless time if made available to teachers to conduct such assessments, ensuring high rates of students success may be difficult. Collaborative efforts among administrators and educators to provide both the time and human resources needed to be addressed if this barrier is to be eliminated. Training paraprofessionals in assessment, as well as developing other time-efficient methods for assessment, are areas that may need to be explored.

2. *Environmental Barriers*

Environmental barriers that may prohibit high student success rates include instructional grouping arrangements (e.g., ability grouping; large and small groups) and goal structures (e.g., competitive goal structures). The bulk of ability grouping research (Brophy & Good, 1970; Damico & Sparks, 1986; Dusek & Joseph, 1983; Eder, 1981; Epstein, 1980; Everston, Sanford, & Emmer, 1981; Eyler, Cook, & Ward, 1982; Femlee & Eder, 1983; Froman, 1981; Grant, 1984; Kimbrough & Hill, 1981; Kulik & Kulik, 1982; Rist, 1970; Rosenthal & Jacobson, 1968; Rowan & Miracle, 1983; Singleton, 1974; Weinstein, 1976) suggests that the social contexts that characterize low ability groupings are not conducive to student success. Good and Brophy (in Good & Weinstein, 1986) summarized some of the negative teacher behaviors that occur when interacting with students they believe to be less capable: a) asking fewer questions and waiting for less time for answers; b) more frequent criticisms and less frequent praise; c) seatings away from the teacher; d) lower academic expectations; e) differential grading in favor of high achieving students; f) less frequent and less friendly interactions; and g) less eye contact and other forms of nonverbal communication that would result in increased student attending and responding -- all effective teaching behaviors that might increase student success rates. Such groupings appear to be contrary to research which supports the positive effects well-planned heterogeneous groupings have on student achievement (cf., Worthingon, Wortham, & Elliott, 1991).

Highly individualized grouping arrangements such as that frequently observed in special education classrooms have been questioned (Elmer, Evertson, & Anderson, 1980; Englert & Thomas, 1982) due to the excessive time and instructional management demands placed on teachers. Leo and Saharie (1981) and Lorentz and Coker (1980) have reported that both small groups and large groupings are positively related to student achievement.

Johnson, and Johnson (1987) identified three classroom goal structures: Cooperative, competitive, and individualistic. According to these authors, each of these goal structures influence the way students interact and the manner in which the teacher achieves an instructional goal. Competitive goal structures appear to be overused in many classrooms and may discourage high student success rates for some students (Anderson, Nelson, Fox, & Gruber, 1988; Johnson, Marruyama, Johnson, Nelson, & Skon, 1981). In contrast, research on the effects of cooperative learning techniques has been positive in terms of increasing motivation, but there is some indication that active learning may decline in some instances (Everston, 1974; cf. McCaslin & Good, 1992); Wang, 1979).

3. *Diverse Student Problem-Solving Styles*

Student problem-solving styles appear to be quite diverse. In a qualitative study, Anderson, Brubaker, Alleman-Brooks, and Duffy (1985) found that high-achieving students were more likely to be both attentive to, and successful on, daily tasks because they appear to use effective skills and strategies (e.g., talking through a task). Their narrative records also indicated that low achievers developed strategies for task completion that did not promote practice and learning the content (guessing, carelessness, attending to inappropriate contextual clues). As noted by Kronick (1988), effective learners also appear to be more successful because their flexibility of thought enables them to anticipate what the teacher might value in a finished product.

4. *Lack of Teacher Knowledge and Skills*

Teachers may lack the knowledge and skills to place students at an entry content level that will maximize student success (Hudson, Colson, & Braxdale, 1984). For example, readability formulas frequently used by teachers to match students with textbooks and the sole use of frequency to establish instructional aims have been questioned empirically (Lovitt, Horton, & Bergerud, 1987; Mercer, Mercer, & Evans, 1982). Additionally, the collection of precise student achievement data appears to be seldom undertaken, even among special education teachers (Cooke, Heward, Test, Spooner, & Courson, 1991; Fuchs, Fuchs, & Warren, 1982; Wesson, King, and Deno, 1984).

Content Coverage/ Opportunity to Learn

Principle 3: ***Increased opportunity to learn content is correlated positively with increased student achievement. Therefore, the more content covered, the greater the potential for student learning.***

Overview

Providing students with ample opportunity to learn has been viewed by some as the single most important instructional principle derived from the effective teaching research (Barr, 1980; Cooley & Leinhardt, 1980; Rosenshine & Berliner, 1978;). Borg (1980) explained that "opportunity to learn" is a more complex concept than allocated time. He distinguished between the two in the following manner: "opportunity to learn" addresses the amount of coverage *actually* provided to students for *specific* academic content whereas "allocated time" examines the dimension of time *assigned* for *broad* content areas (e.g., reading, mathematics). Simply stated, "... students tend to learn what they are taught and not to learn what they are not taught" (Powell, 1979; p.50). Results from the Beginning Teacher Evaluation Study ([BTES] in Block, 1980), have provided considerable support for the signficant, positive relationship between opportunity to learn and student achievement. Variations in student achievement can be explained, at least in part, by variations in content coverage (Englert, 1983; Powell, 1979; Wyne & Stuck, 1982). Generally, results from the BTES have provided support that when teachers cover skills, most students learn them (Powell, 1979).

Although these findings appear quite simplistic, Husen (1967) has explained that content coverage variations across countries explain much of international achievement differences on tests. Kindsvatter, Wilen, & Ishler (1988) have suggested that content coverage might best be viewed in terms of the "appropriateness" of the learning task for the student, the curriculum, and the assessment(s) used. Morin (1986) maintained that curriculum development should occur within the contexts and needs of the community, school, and classroom.

Several variables appear to interact and impact substantially on both the amount and the quality of content coverage: a) the manner in which curriculum is determined and implemented; b) the nature and quality of teacher planning; c) the environmental demands placed on students; and d) the validity of the tests used to assess content mastery. A review of each these variables follows.

Curriculum Determination and Implementation

Curriculum may be determined for teachers by school boards, administrators, curriculum publishers and may be communicated through such channels as curriclum guides, district-wide objectives, course syllabi etc. (Berliner, 1988; Kindsvatter, Wilen, & Ishler, 1988). As reviewed by Kindsvatter, Wilen, & Ishler (1988), several studies have determined that curriculum developed from such sources only partly determine the content covered. As noted by Berliner (1988), "The teacher is the final arbiter of what content gets taught" (p. 9).

Brophy (1982), in his review of research conducted at the Institute for Research on Teaching (IRT) at Michigan State University, described two ways in which curriculum may be determined: a) conscious decision-making by individuals in selecting the curriculum to be taught, and b) reductions and distortions of the intended curriculum during the process of attempting to teach it.

Results from the IRT studies reviewed by Brophy (1982) revealed several important findings regarding the fomer determinant. When 4th grade math curricula were studied, there was a common content core included across curricula, but this commonality comprised less than half of the material included in any one curriculum. Also, when external pressures, such as mandated guidelines with accountability measures were applied consistently, teachers tended to adopt and implement the established curriculum more readily. As reviewed by Brophy (1982), teachers reported that district-wide objectives, followed by standardized tests that would become public knowledge, would present the most pressure for them to adopt and implement a specific curriculum. This study also revealed that the educational beliefs which teachers hold (e.g., the appropriateness of content for their students) may be considered in curriculum decision-making and may, to some extent, mediate external pressures placed upon teachers.

Distortions and reductions in curriculum often occur. As described by Brophy (1982), curriculum distortions occur when deletions or additions are made in the mandated or adopted curriculum. Brophy described the process by which distortion occurs. The mandated curriculum adopted at the state or district level may be distorted when individuals in the school department make mutually-agreed upon changes in the curriculum, Even further distortion may occur when individual teachers decide to add or delete parts of the curriculum in their respective classrooms. Curriculum distortions also may occur in classes grouped by ability due to the differential ways in which content is approached in low-ability groupings (cf., Brophy, 1982). Such classes have been characterized by content fragmentation, repetition, and limited exposure to integrating concepts. Confrey and Good (1981) found that low-ability classes spent much of the time on repetition and drill activities which lacked adequate presentation by the teacher. Curriculum reductions may also occur when time and environmental demands preclude the coverage of particular topics or allow for only partial, inadequate coverage. Finally, curriculum distortions may occur when the teacher has an inadequate command of the content to be taught.

Numerous variables appear to influence content coverage decisions made by teachers. Schwille, Porter, Belli, Floden, Freeman, Knappen, Huhs and Schmidt's (1981) study identified several factors that appear to influence teacher's content coverage decisions: a) the effort required to teach the content; b) the difficulty of the content; and c) the techers' personal feelings of enjoyment when teaching thee content. Several studies have indicated that teachers who enjoy teaching a specific content area are not only more likely to *teach* a specific content, but also more likely to spend more time teaching it (Brophy, 1982; Carew & Lightfoot, 1979); Schwille et al., 1981). Other teacher-decision making variables that may influence content coverage are a) how much time will be devoted to each topic; 2) the topics to be covered; 3) the students to be taught; 4) when and for how long each topic will be covered; and 4) the degree of student mastery required by each topic (Brophy, 1982).

There is some empirical evidence (cf., Brophy, 1982) that teachers may over-rely on published curriculum materials, particularly teacher guides and textbooks, to determine content coverage. Such over-dependence may discourage active planning and decision making by the teacher. In short, teachers may perceive themselves as curriculum implementers rather than active planners or decision-makers. As an adjunct to the over-reliance on curriculum materials, several studies (cf., Brophy, 1982) have suggested that teachers may spend more time addressing the "what's and how's" of instruction rather than spending the essential time needed to develop objectives to guide their teaching. These findings directly support the principles of explicit teaching (see Principle 8 for additional information). Teacher failure to make purposes and objectives clear to students may result in a discrepancy between teachers' and students' perceptions regarding the meaning of the activities (Brophy, 1982).

Smith and Anderson (in Brophy, 1982) recognized that teachers' over-reliance on published curriculum materials is perhaps best explained by the excessive time demands with which teachers are confronted. To assist teachers in providing more appropriate content coverage, these authors made the following suggestions for curriculum publishers and developers:

1. guides and other materials should emphasize conceptual *change* and not just new learning of a lesson (e.g., teachers should be alerted that some students may enter the lesson with erroneous preconceptions about the content);

2. specific information regading the "connectiveness" of lessons should be included, and efforts should be made to assist teachers in instructing students regarding how concepts and activities are inter-related; and

3. explicit instructions should be provided to teachers so that they may communicate the meaning(s), purpose(s), and objective(s) of the content activity to students.

Effective teachers not only have high expecations for students, but also place strong emphasis on the attainment of academic goals. Such classrooms are characterized by what has been termed as "high academic press" (BTES, Fisher, Berliner, Marliave, Cahen, & Dishaw, 1980). Research from the BTES (in Fisher et al., 1980) provides support for the increased student learning that is associated with high academic press. Additionally, when teacher place primary emphasis on affective outcomes rather than academic outcomes, student learning may decrease (BTES, Fisher et al., 1980).

The type of activities provided to student also appear to impact student achievement. Stallings and Kaskowitz (1974) found that those activities which had an *academic focus* (e.g., use of textbooks and other instructional materials) resulted in greater achievement than those whose activites were less academic in nature (e.g., stories, arts and crafts, active play, toys, puzzles, even academic games).

Wyne and Stuck (1982) identified several ways to increase students opportunity to respond: (a) beginning and ending lessons on time; (b) reducing transition time; (c) minimizing waste time; and (d) monitoring students at all times.

Teacher Planning of Content

Content coverage requires thoughtful decision making, particulary during the planning stage of instruction. Such decisions include determining student needs, assessing material level, analyzing the prerequisite knowledge acquired by students, and indivdiualizing/evaluating the material covered (Kindsvatter, Wilen, & Ishler, 1988, p. 55). Effective teachers, according to Eggan and Kauchak (1988), *plan purposefully* for student learning, and this planning requires a careful analysis of goals and the thoughtful selection of appropriate content for students. Good 's (1986) review of research on effective teaching supported the finding that prior planning and organization on a daily basis resulted in improved student learning.

When planning, teachers should incorporate into their plans, effective teaching practices. As reviewed by Rosehnshine (1983; 1986), effective teachers incorporate the following instructional sequence into their content lessons: a) beginning the lesson with a short statement of goals; b) reviewing previous learing; c) presenting new material in small steps, allowing students practice time after each step; d) giving clear and detailed instructions/explanations; e) providing active and ample practice; f) asking questions, checking for understanding, and obtaining responses from all students; g) providing guided practice; h) providing providing explicit instruction; and i) providing practice for fluency attainment. Rosenshine emphasized that though while these steps may not be approriate for all learners, they are appropriate when material is new, difficult, hierarchical, or when students are young or experiencing learning difficulties.

Student Environmental Demands

Ellis and Lenz (1990) expressed concern over the limited opportunities to learn that resource room students with mild learning disabilities experience in specific content areas (e.g., social studies, science). Students who have attended pull out programs in-lieu-of specific content area classes (e.g., resource rooms, compensatory programs) may be confronted with unique content learning problems. When these students are expected to master the same content as their general education peers, their prerequisite content-area skills may be quite limited. Over time, this discrepancy may continue to widen and become even more apparent in secondary settings. Robinson, Braxdale, and Carlson (1985) have suggested that a mismatch between the learning environment and the learner's present level of achievement results in school failure. They recommended that an analysis of environmental deamnds (e.g., academic, social/adaptive demands, and sutdy/self-management demands) be undertaken to determine an appropriate student-content match. Schumaker and Deshler (1988) recommended that instruction in general education move from a teacher-centered to student-centered orientation to better meet the needs of these individuals.

Effective teachers have demonstrated that they have a greater understanding of the special characteristics of their students and plan actively to meet their needs. McCormick's (1979) study of effective teachers suggested that effective teachers (a) more often adapted instruction for students, (b) use ability- and age-appropriate vocabularly for students, (c) adjusted questionining levels to the ability level of their students, and (d) made their presentations at an appropriate level of difficulty for students. Effective teachers also appear to plan enough time so that students have sufficient time to master content before moving to new content (Clark, 1992; Gerber, 1986; Wang, 1979).

Validity of the Tests used to Assess Content Mastery

Measuring the degree of content covered by a specific teacher or school district is at least partly a function of the extent to which the test(s) used match both the curriculum content and the instruction provided. Cunningham (1986) distinguished between curricular and instructional validity: "Curricular validity refers to the degree to which a test measures the curriculum of a school system; instructional validity is the determination of whether what is included on a test is actually taught to students" (p. 129). As noted by Cunningham (1986) and Borg (1980), educational reforms movements concerned with improving the quality of education have resulted in a plethora of tests used to measure student mastery of minimum comptencies. He extended caution, however, as problems with both curricular and instructional validity become of paramount concern when standardized tests either do not assess the actual content covered or when students have not been provided with instruction in specific content areas. Decisions to use tests to measure content mastery, therefore, must be made with thoughtful consideration of the more traditional psychometric properties of the test(s) (e.g., adequate standarization, reliability, criterion-related valdity, construct validity) as well as a careful review of the curriculum- and instructional-test match.

Definitions and Examples of Terms

Content Coverage

Content coverage "...refers to the topics studied in terms of the appropriateness of the learning task for the learner, the curriculum, and the assesment" (Kindsvatter, Wilen, & Ishler, 1988; p. 164).

Example: When teaching multiplication, a teacher uses a well-sequenced mathematics curriculum and appropriate informal mastery tests to determine the point in the multiplication skill continuum where individual students should be placed.

Opportunity to Learn

The extent to which specific academic content has been covered (Borg, 1980).

Example: A student's opportunity to learn multiplication could be assessed by examining the extent to which instruction in multiplication was provided by the teacher.

Academic Press

A classroom environment characteristized by a teacher who values academics highly and communciates those expectations to students (Fisher et al., 1980).

Example: Despite a heterogeneous grouping of students who display a wide range of achievement levels, a teacher communicates the expectation that all students will reach a substantial, albiet diferent, level of content mastery.

Limitations/Barriers to Effective Use

1. *Curriculum Determination and Implementation Barriers*

As reviewed previously, the manner in which curriculum is developed and implemented can present significant barriers to the content covered by teachers. Eliminating curriculum distortions and reductions may be realized when (a) teachers are involved in the development of curriculum, (b) careful monitoring of curriculum implementation occurs, (c) accountability procedures are provided to ensure that the curriculum content is systematically covered, and (3) educating all involved in curriculum development and implementation regarding those dynamic variables that impact upon content coverage.

The tendency for teachers to over-rely on published curriculum materials poses another barrier to content coverage. Curriculum publishers can reduce this over-reliance by actively taking steps to ensure that teachers (a) develop and make explicit to students specific content goals and objectives, and (b) incorporate into their materials specific information regarding how concepts and activities are related. Teachers, district curriculum developers, and school administrators can also eliminate distortion and reductions by (b) carefully reviewing materials prior to their selection to determine to which materials cover curriculum goals and objectives, and are approriate to the needs of learners.

Limitations/Barriers to Effective Use (continued)

The expectations teachers have regarding students' achievement poses another potential barrier to content coverage. Assisting teachers to develop high expectations for all students and to incorporate activities into their classroom that are characterized as having an academic focus is central to elminating these barriers. Additionally, increasing students' opportunities to respond can be increased when teachers are providing with the education and wheretheal to structure their instructional time to maximize student achievement (e.g., reducing transition time, reducing waste time).

2. *Teacher Planning of Content*

Student learning may decrease when teachers are not provided with ample planning time. Though time for planning poses a significant barrier to content coverage, teachers need specific instruction in "how to plan." Educating teachers in the area of effective planning (such as that suggested by Rosehnshine, 1983; 1986). Assiting teachers to incorporate into their plans strategies and techniques know to increase student learning (e.g., communicating goals and objectives to students, asking frequent questions and providing corrective feedback) are shoūld be a central focus of such education.

3. *Student Environmental Demands*

Proceeding to cover content in which students have not acquired the essential prerequisite skills presents yet another barrier to content coverage. Teachers, through careful assessment of students' environments and achivement levels can remove this potential barrier. Essentially, the teacher's aim is to provide each student with an appropriate content-student match in order to maximize the potential for content mastery.

4. *Validity of the Tests used to Assess Content Mastery*

Using inappropriate tests to measure students' mastery of content presents another significant barrier. Teachers, school administrators, and others must either develop or select from published materials, those instruments which best match established curriculum goals and objectives. Also, steps to insure that students are provided instruction in each content area measured by the tests must be undertaken. Otherwise, the results obtained from such tests are meaningless in determining whether or not students have mastered content areas of concern.

Grouping for Instruction

Principle 4: ***Students achieve more in classes in which they spend much of their time being directly taught or supervised by their teacher. In general, teacher instructional time that is spent with large groups is correlated positively with student achievement whereas teacher instructional time that is spent with only one or two students is correlated negatively with achievement.***

Overview

The manner in which teachers deliver instruction (i.e., in large/small groups or individually is an important instructional principle that directly impacts student achievement. In general, whole or large group instruction has been recognized as the most effective and efficient instructional approach to teaching basic skills (Brophy & Good, 1986; Englert, 1984; Kindsvatter, Wilen, & Ishler, 1988; Lorentz, 1980; cf., Rosenshine & Berliner, 1978; Stevens & Rosenshine, 1981). Grouping arrangement per se' is not the primary determinant of student achievement. Rather, large group instruction appears to increase the time teachers provide instruction, demonstration , modeling, explanation, and corrective feedback (Brophy, 1979; Evertson, 1979). In essence, when students are in small groups or work individually, direct teacher instruction and monitoring become difficult for the teacher (Polloway; Cronin, & Patton, 1986; Evertson & Anderson, 1979; cf., Rosenshine & Berliner, 1978). McCaslin and Good (1992) reported that small group instruction may promote passivity and student dependency behaviors. In small groups, students may engage more in procedural activities rather than engaging in learning behaviors that promote mastery of content (McCaslin and Good, 1992). Evertson (1979) reported that less effective teachers spent more time engaging in private contacts which were either remedial in nature or were attempts to control student misbehavior.

In his review of the results of the Beginning Teacher Evaluation Study, Rosenshine (1980) repo ted that students on the average, spend about 30% of their time in teacher-led settings and 70% of their time in seatwork activity. He concluded that this imbalance is due primarily to the tendency of teachers to divide the class into three or more groups, thereby decreasing the amount of direct instructional time. Small group instruction appears to be commonplace. In a study conducted by Ysseldyke, Thurlow, Wotruba, and Nania (1990), over half of the general education teachers surveyed reported that they used small groups for instruction (average range per group: 1 to 6 students).

Though whole group instruction is positively and significantly related to student achievement, efforts to individualize instruction need not be abandoned. Polloway, Smith, and Payne (in Polloway, Cronin, & Patton, 1986) defined individualization as instruction that is appropriate to the individual. This type of instruction can be delivered individually, in small or large groups. As addressed by Polloway, Cronin, and Patton (1986), individualization is effective *if* it includes those elements of effective teaching. Kindsvatter, Wilen, and Ishler (1988) suggested that the most efficient approach to teaching occurs when the teacher conducts a lesson with the whole class and then provides ample practice f... all students. Such practice, according to these authors, can be individualized through the provision of different activities based upon individual student need.

Johnson, Flanagan, Burge, Kaufman-Debriere, and Spellman (in Polloway, Cronin, & Patton, 1986) cited several advantages of whole or large group instruction: (a) more efficient use of teacher time; (b) more efficient student management; (c) increased instructional time; (d) increased peer interaction; and (e) increased generalization of skills. Additionally, large group instruction can promote observational and pragmatic learning, increase generalization of skills, and facilitate overlearning (cf., Polloway, Cronin, & Patton, 1986).

As reviewed by Shavelson and Borko (1979), teachers reported using a variety of information to determine grouping arrangements in their classrooms. Student achievement levels, class participation, work habits, social competence, cooperation, self-concept and problematic classroom behaviors are all factors which teachers may consider when making grouping decisions. Russo (in Shavelson & Borko, 1979) reported that student achievement, particularly in the area of reading, may greatly influence a teacher's decision to place students in ability groups. Epstein (1980) reported that over half of all elementary schools use ability grouping. Rist's (1970) study revealed that ability grouping decisions may be made based on such irrelevant student characteristics as socioeconomic status and appearance. In this study, far-reaching implications were noted as once grouped by ability, students remained in their respective groups for years. When grouping by ability, teachers also may alter their instruction accordingly (e.g., high groups may receive less structure and more abstract material whereas low groups may receive more structure and more concrete material). Differences in pacing in various groups has also been observed (cf., Shavelson & Borko, 1979; cf., Washington, 1979). The pace in high ability groups appears to be much more rapid than that provided in low ability groups. These results should be interpreted with caution, however, as Berliner (1988), in his review of research on grouping decisions, concluded that we currently have only a limited understanding of the dynamics involved in teacher grouping decisions.

Definitions and Examples of Terms

Individualization "... instruction appropriate to the individual even though it is not always accomplished on a one-on-one basis... In this sense instruction can be accomplished through one-to-one or one-to-two ratios, in small groups, or even in large groups in some cases" (Payne, Pollway, Smith, and Payne, 1981, p. 46-47).

Example: In a mathematics class, all students who have not mastered subtraction with regrouping are provided with instruction, materials, and activities on this skill.

Ability Group	A grouping arrangement in which the teacher divides the class into homogeneous groups based upon some ability criterion (e.g., reading level, mathematics level). *Example*: A reading teacher may administer placement to students to determine the most appropriate basal reading text for them. The teacher may then divide the students into instructional groups accordingly.
Large Group	A grouping arrangement in which the teacher provides instruction to a large number of students (an optimal number has not been determined). This arrangement may include providing instruction to the entire class. The primary goal in this arrangement is to increase the amount of direct instructional time provided to students i.e., keeping groups large enough so that the teacher can spend more time instructing, monitoring, providing feedback, etc. *Example*: A science teacher who is teaching a geology unit may deliver instruction on the formation of coal to the entire class through demonstration, lecture, etc.
Small Group	A grouping arrangement in which the class is divided into small groups for instruction. Small groups generally range in number from two to six students per group (Ysseldyke, Thurlow, Wotruba, & Nania, 1990). *Example*: Results from an informal pre-test suggest that only three students need additional instruction in basic sight word recognition. The teacher may group these three students together and then provide sight word instruction to them.
One-on-One Instruction	Instruction provided to one student by one teacher. Such instruction is characterized by sole attention to the student by the teacher, and instruction is based upon the individual student's needs. *Example*: Pre-testing indicates that only one student in a first grade reading class does not recognize initial consonant blends. While the remainder of the class works independently, the teacher works solely with this student on consonant blend recognition skills.
Whole Group Instruction	A grouping arrangement in which the teacher provides instruction to the entire class. Such instruction is characterized by substantive interaction between the teacher and students (e.g., teacher demonstration, modeling, monitoring, and provision of explanation and corrective feedback (Brophy, 1979). *Example*: When teaching word problems, a mathematics teacher instructs the entire class by providing numerous examples, questioning the class frequently to determine students' comprehension, and providing corrective feedback to students.

Limitations/Barriers to Effective Use

1. In classrooms characterized by extreme ranges in student ability, whole class instruction may be difficult. When classes are heterogeneous and individualization does not occur, task engagement and student success rates may decline. Although ability grouping may be necessary, McGeal (in Kindsvatter, Wilen, & Ishler, 1988) recommended that teachers should exert caution when working with small groups, making sure that they do not spend excessive amounts of time away from the remainder of the class.

2. In special education classes, many may assume that one-on-one instruction is the accepted standard practice. As observed by Polloway, Cronin, and Patton (1986), there has been little attempt to determine the efficacy of one-on-one instruction. Additionally, the special education teacher may do well to carefully di tinguish between individualization and one-on-one instruction. The special education teacher should remember that individualization may encompass one-on-one instruction and small and large group instruction. Consequently, grouping students for instruction may not run contrary do the intent of the individualized educational plan.

Scaffolded Instruction

Principle 5: ***Students can become independent, self-regulated learners through instruction that is deliberately and carefully scaffolded.***

Overview

Definition of Scaffolded Instruction

Hetherington and Parke (1986) offered the following definition of scaffolding: the process of helping children "... achieve more than they can on their own by skillfully structuring the environment to make it easier for them" (p. 293). In much the same way that a scaffold is used as a temporary structural support during building construction, scaffolded instruction serves as a temporary and adjustable support for students to develop new skills and abilities (Englert, Raphael, Anderson, Anthony, & Stevens, 1991; Pearson,& Raphael, 1990).

Implicit in the idea of scaffolded instruction is that the teacher enables learners to participate in complex tasks that they cannot perform adequately without assistance (Reid, 1991). Scaffolded instruction is *not* errorless learning; that is, errors are *expected* and are corrected gradually through teacher re-direction and feedback. When implementing scaffolded instruction, teachers must ensure that sufficient, but not excessive, support is provided to the learner... a delicate balance between diminishing teacher guidance and increasing student competence should be maintained. Although the teacher initially assumes much of the control during scaffolded instruction, the ultimate goal of instruction is covert, independent self-regulatory learning.

Inherent in scaffolded instruction is Vygotsky's (1978) notion of the zone of *proximal development*. Vygotsky defined this zone as "... the distance between the actual development level as determined by independent problem solving under adult guidance, or in collaboration with more capable peers" (p. 86). Stated simply by Harris and Pressley (1990), the zone of proximal development is that "area between what a learner can do independently (mastery level) and what can be accomplished with the assistance of a competent adult or peer (instructional level)" (p. 1).

Characteristics and Critical Features of Scaffolded Instruction

Pressley, Harris, and Parks (in press) reviewed Rogoff's six characteristics of scaffolded instruction: (a) enlisting or recruiting of the learner's interests; (b) reducing the number of steps required to solve a problem to a level where the learner can meet the task requirements with assistance; (c) keeping the learner in pursuit of the task; (d) accentuation of the critical features of the task (e.g., comparing the learner 's product with the desired product); (e) keeping learner stress at a minimum; and (f) explicitly demonstrating task completion or explictly modeling an idealized solution to a problem.

The authors have identified five critical features of scaffolded instruction. They are as follows:

1. Scaffolding is Socially Mediated, Dialogical Learning

According to Paris and Winograd (1990a), the distinguishing feature of scaffolded instruction is the prominent role of dialogue between teacher and student. This give-and-take exchange between teacher and learner, termed Socratic dialogue by Meichenbaum (1977), is reminiscent of Dewey's (in Sprinthall & Sprinthall, 1976) interactive concept of learning.

The purpose of dialogical exchange is to provide the learner with just enough guidance and support to accomplish goals that are impossible without assistance (Wood, Bruner, & Ross, 1976). This important feature of scaffolded instruction is derived from Vygotsky's notion of socially mediated learning. As reviewed by Englert et al. (1991), Vygotsky asserted that inner or egocentric speech emerges during the social, dialogical exhange between the child and adult (or other more mature language user). According to Vygotsky's theory, the adult initially models much of the inner dialogue for the young child and controls the actions of the child through social mediation. However, over time and through repeated experiences, the child begins to internalize, and assumes responsibility for, dialogical actions i.e., it becomes a "private speech" spoken aloud by the child to direct personal cognitive activity. Eventually, this private speech becomes covert (i.e., inner, self-guided) which is automatic, requiring little conscious thought. An excellent illustration of the notion of socially-mediated, dialogical learning is the young child who is learning to tie his shoes. An adult overtly explains and models the tying of one's shoes numerous times for the child. Eventually, the child begins to internalize this dialogical exchange and may speak aloud the "steps" to tying one's shoes. As the teacher models and verbally elaborates each step by coaching the child as the process is performed, the child gradually attains competency. Shoe tying dialogue becomes completely internalized and becomes so automatic that the covert dialogue becomes unconscious.

The ultimate goal of shoe tying (for which *every* parent strives!) for any learning activity is for the child to become independent. Scaffolded instruction, therefore, has as its ultimate goal, independent, self-regulated learning. Such instruction begins as an overt, social dialogical exhange between teacher and student with the dialogue becoming a covert, ultimately internalized. *This does not mean that the child simply imitates or mimics the adult.* As we all know, children (and adults) may develop their own personalized version of problem-solving behaviors. For example, the son of one of the authors continues to this day, despite innumerable attempts to correct, to tie his shoes in his own, rather unique way. The teacher's responsibility, therefore is to provide the conditions through which the child constructs his/her own understanding and use of the strategies that incoporates the essential elements of efficient and effective use. The role of the teacher is to mediate this constructing process to ensure critical elements of the strategy are incorporated into the student's understanding and use.

2. Scaffolding Involves Elaboration of Learning

Students learn best when they are allowed opportunities to elaborate on material to be learned by making the connection between what is to be learned and what has been learned previously (Pressley, McDaniel, Turnure, Wood, & Ahmad, 1987; Swanson, 1991). According to King (1992), elaboration has many forms: addition of details to information, clarifying ideas; explaining and constrasting two or more concepts; making inferences, visualizing an image of material to be learned, making analogies to relate new ideas to familiar ideas, or associating new material with past knowledge or experiences. Implicit in the idea of elaborative learning is that such an activity makes material more meaningful and personal to the learner. As reviewed by King (1992), learners frequently do not engage in elaboration without prompting or cuing nor do that spontaneouly activate and use their prior kowledge. Additionally, King noted that self-generated elaborations have been found to be more effective than those provided by teachers, textbooks or other external sources.

As addressed earlier, scaffolded is not errorless learning, and the role of elaboration in learning is a critical feature of scaffolding. Consider the shoe tying illustration once again. As *any* shoe tying instructor knows, such a process entails innumerable questioning and answering exchanges between child and instructor. Neither modeling nor filling in the steps to shoe tying are the most efficient paths to mastery. Typically, for the child to efficiently master this behavior, both instructor and child engage in in intensive and extensive elaborative exhanges. Corrective feedback and monitoring also characterize this elaborative process.

In their informative review, Englert et al. (1991) stated: "Teachers have the responsibility to model strategies as they 'think aloud' to make make visible the normally invisible cognitive processes..." (p. 339). As noted by these authors, it is equally important that students participate in this collaborative social dialogue as they begin to take increasing responsibility for their inner speech and active learnng (*An important caution*: scaffolded instruction is *not* simply modeling or thinking aloud about cognition, it's completion occurs only when learners have covertly internalized the dialogue on an automatic, unconscious level that the instructional process has been completed).

As addressed by Englert et al. (1991), teachers scaffold in many ways. Some of these ways include (a) activating background knowledge by asking a series of graduated questions that help students retrieve relevant information, (b) acting as a coach who provides tips, strategies, and cues to enage students in processes that promote independent learning, and (c) procedural facilitation (e.g., providing prompts such as "think sheets" that prompt students to engage in specific strategies, such as the steps involved in long division).

3. Scaffolding is Proleptic Teaching

Proleptic teaching, as described by Palinscar (1991) and Pressley, Harris, and Marks (in press), refers to instruction that anticipates learner comptence. That is, scaffolded instruction assumes that eventually, each student will attain independent, self-regulated competence of the skill. As noted by Palinscar (1991), the degree of participation in scaffolded exchanges, as well the realization of independent, covert self-regulation, will vary according to each child's ability.

4. Scaffolding is an Individualized Instructional Approach

Scaffolded instruction is an individually tailored form of instruction. When attempting to implement this instructional principle, the teacher should consider the learner's needs, predilections, interests, and abilities (Harris & Pressley, 1990). Such an approach necessitates what Harris and Pressley refer to as a "cognitive-functional assessment" which requires thorough affective, behavioral, and cognitive assessments that are sensitive to developmental and ecological concerns unique to each child. For example, the errors which many children use in mathematical computations are both numerous and quite idiosyncratic. A functional assessment to determine the processes each child employs to solve computations is critical to effective scaffolded instruction. Teachers should be sensitive to the rather unique, sometimes ineffective, problem-solving approaches children use. Functional assessments administered prior to instruction are essential in determining the zone of proximal development. The results of such assessment lead to individualized planning and implementation of individually tailored scaffolded instruction for each child (for additional information, refer to Instructional Principle 11).

5. Scaffolding Involves Both *Recursive* and *Spiral* Learning

As tasks become increasingly complex, scaffolding learning continues in a recursive fashion. That is, while concepts to be taught and learned may become increasingly more sophisticated as student mastery is attained, the "steps" of scaffolded learning remain the same. Thinking, according to Schiever (1991), develops from concrete to abstract processing of concepts. An illustration by Schiever is the meaning of the word, "cold." Initially, she explains children's concept of "cold" is the meaning a child ascribes to feeling a "cold object." As the child repeatedly experiences newer contextual meanings of the word, "cold" (e.g., a *cold* war, a *cold* personality), these conceptual meanings become more complex and refined. While the notion of scaffolded instruction remains recursive (i.e., the instructional processes remain the same, though dynamically tailored to the needs of the child), increasingly complex learning concepts, presented in a spiral fashion, can be provided.

Instructional Models that Incorporate Scaffolded Instruction

Numerous models include critical features of scaffolded instruction in their designs. Among these are: reciprocal teaching (Palinscar & Brown, 1984; cognitive apprenticeship (Collins, Brown, & Newman, 1989); self-generated verbal elaboration (King, 1992); and self-instructional strategy development (Graham and Harris, 1989). As an illustrative example, an overview of reciprocal teaching follows.

Reciprocal Teaching - Overview *

Palinscar (1986) described reciprocal teaching as "...a dialogue between teachers and students for the purpose of jointly constructing the meaning of text" (p. 119). Reciprocal teaching, when used to enhance reading comprehension skills (Palinscar & Brown; 1984), is comprised of a general set of procedures that incorporate elements of scaffolded instruction.

The general guidelines for reciprocal teaching include four cognitive strategies: (a) predicting future content, (b) question generating, (c) summarizing the main content of a passage/paragraph, and (d) clarifying (determining when confusion or a problem exists and corrective action is then taken). This approach, described as metascriptual, relies greatly upon the skills of the teacher or individual conducting the instruction.

According to Billingsley and Wildman (1990), the reciprocal teacher begins with a brief discussion to activate students' prior knowledge and then students use this knowledge to make predictions about the passage. The teacher models or demonstrates *how* to predict, summarize, question, and clarify, eventually guiding students to perform these activities independently. The teacher models and provides assistance by (a) prompting, (b) instructing, and (c) modifying the activity. Ultimately, students "act as teachers" by engaging in the activities independently.

The following reciprocal teaching routine in reading comprehension was described by Palinscar (1991):

1. The teacher reads the title of the story and elicits predictions from the students as what they would expect to learn or would like to learn from a story with this title.
2. The teacher then summarizes the students' predictions and adds his own, if appropriate.
3. The teacher assumes leadership reads the first part of the story usually one paragraph or passage at a time).
4. The teacher then asks a guestion about the paragraph/passage, and the group answers the question.
5. Members of the group then suggest additional questions and the group provides responses.
6. The teacher summarizes the lessons, and the group is invited to elaborate upon the summary.
7. The group, under the teacher's leadership, then discusses any words or ideas that were unclear or confusing.
8. Tthe discussion then asks students to predict what they might hear next in the paragraph/passage, and steps begin again until the story is completed.

Note: During the initial phase of reciprocal teaching when students are beginning to learn the process, the teacher assumes the leadership responsibility. As students develop the process skill, the teacher may assign a discussion leader to direct the reciprocal activities.

Definitions and Examples of Terms

Elaboration

The process of making connections between the material to be learned and previously learned information (Swanson, 1991).

Example: Swanson (1991) provides the following examples of elaboration: "For example, a child who is presented with spelling words to remember, forms associations to those words by using extra ways of mediating the information (e.g., using the process of imagery to visualize the word *boy*), proposing or answering questions about the word (e.g., asking 'Is a *boy* the same as a man?'), categorizing information (e.g., thinking that the *boy* represents one of the two genders) or associating the word with a context (e.g., recalling that the teacher used the word *boy* in several sentences) (p. 134).

Limitations/Barriers to Effective Use

Limitations of Scaffolded Instruction

Paris and Winograd (1990b), Reid (1991), and Herman (1990) identified a number of limitations of scaffolded instruction. They are as follows.

1. *Initially, Scaffolded Instruction is Labor Intensive*

   Scaffolded instruction requires concerted teacher effort to implement. As the zone of proximal development may differ for each student, the teacher may become overwhelmed when attempting to use scaffolded techniques.

2. *Scaffolded Instruction Requires an Empathetic Teacher*

   Teachers who implement scaffolded instruction must be sensitive to student needs. Awareness of the student needs and abilities is central to the successful implementation of scaffolded instruction.

3. *Scaffolded Instruction Requires a Skilled Teacher*

   A teacher who implements scaffolded instruction must be skilled in dialogical, mediated learning techniques. As is the case with reciprocal teaching, teacher preparation in this area is critical to successful implementation.

4. *Some Teachers may have Difficulty with the Degree of Error that Occurs in the Initial Phases of Scaffolded Instruction*

Teachers may have difficulty accepting the graduated nature of scaffolded instruction. Teachers, particularly, special education teachers, may be accustomed to providing students with material at a level that ensures almost errorless learning. Becoming comfortable with allowing students to make errors may be an inhibiting variable. Additionally, teachers may have to revamp their grading procedures that will not penalize students for making errors.

5. *Scaffolded Instruction Does Not Readily Lend Itself to Teacher-Manuals, Curriculum Guides, etc.*

Scaffolded instruction is a recursive process. Many availabe teacher-manuals and curriculum guides have linear orientations that do not address this recursive process of learning.

ADDRESSING FORMS OF KNOWLEDGE

Principle 6: ***The critical forms of knowledge associated with strategic learning are (a) declarative knowledge, (b) procedural knowledge, and (c) conditional knowledge. Each of these must be addressed if students are to become independent, self-regulated learners.***

Overview

Any discussion of knowledge might best be prefaced by an overview of the importance of metacognition and its central role in learning. Metacognition (i.e., *knowing about knowing*), a term originated by Flavell (in Wong, 1991), is defined as "... one's knowledge concerning one's own cognitive processes and products or anything related to them, e.g., the learning-relevant properties of information or data" (in Wong, 1991, p. 233. Flavell (in Wong, 1991) identified two types of metacognitive activities: (a) knowledge about cognition and (b) regulation of cognition. Knowledge about cognition, according to Wong (1991), "... concerns an individual's knowledge about his own cognitive resources and the compatibility between himself as a learner and the learning situation." (p. 233) Knowledge about regulation of cognition include one's awareness and control over cognition during problem-solving (e.g., planning, monitoring, testing, revising, and evaluating).

Alexander, Schallert, and Harre (1991) defined knowledge as encompassing "... all that a person knows or believes to be true, whether or not it is verified as true in some sort of objective or external way" (p. 317). Numerous researchers and theorists have proposed different forms of knowledge (cf., Billingsley & Wildman, 1990; Bos & Vaughan, 1988; cf., Bransford, Sherwood, Vye, & Rieser, 1986; Derry, 1990; Hresko & Parmar, 1991; Sternberg, 1991). However, according to Alexander, Schallert, and Hare (1991), regardless of the type of knowledge studied, (e.g., content knowledge, linguistic knowledge), three distinct forms of knowledge are subsumed: (a) *declarative*, (b) *procedural*, and (c) *conditional*. For example, if we refer to a domain-specific knowledge, such as mathematics, we (a) know factual information about it (declarative knowledge), (b) know how to use the knowledge in specific ways (procedural knowledge), and (c) know when and where to apply this knowledge (conditional knowledge).

Delimited to the forms of knowledge required for strategic learning and performance, Ellis (1992) identified three essential forms of knowledge: (a) *declarative knowledge* (essentially synonymous with semantic knowledge); (b) *procedural knowledge* (i.e., the degree of familiarity a student has for the specific steps of a given strategy); and (d) *conditional knowledge* (when and where to use a specific strategy). Each of these forms of knowledge must be addressed when teaching students learning strategies. An overview of the forms of knowledge, as reviewed by Ellis (1992), follows.

Declarative Knowledge

Declarative knowledge is the factual knowledge that the student brings to a task. For example, when learning subtraction facts, the student's knowledge of addition facts is a form of semantic knowledge. The student, when approaching the task of solving subtraction facts, can access his/her knowledge of addition facts to assist in the new problem-solving situation. To facilitate the acquisition of declarative knowledge, teachers should ensure that students possess the prerequisite or prior declarative knowledge necessary to the instructional task. Teachers can activate such knowledge by (a) teaching and/or reviewing prior knowledge or prerequisite skills as needed, and (c) explicitly identifying the prior knowledge or prerequisite skills needed for the task.

Procedural Knowledge

Process knowledge is "... knowing how to perform a specific cognitive strategy" (Ellis, 1992, p. 2). For example, the steps involved in a popular paraphrasing strategy, include (a) reading the paragraph, (b) finding the main idea, and (c) putting the main idea into one's own words. Procedural knowledge, simply stated, would be the knowledge of the steps or routines in this particular learning strategy. As addressed by Ellis (1992), procedural knowledge also includes the skills needed to regulate the use of strategy steps when a problem is encountered. Stated another way, procedural is how to use metacognitive self-regulation processes necessary for effective application of cognitive strategies. Implications for effective strategic teacher include overt modeling of the critical cognitive processes involved when performing a learning strategy so that students' can adapt and internalize these cognitive processes.

Conditional Knowledge

Conditional knowledge is knowing when and where to use specific strategies. For example, a student should know when it is appropriate to adapt a paraphrasing strategy in a specific content area (such as social studies) to complete a textual summary. Implications for teachers are that at least some portion of strategy instruction time should be devoted to assisting students to adapt and generalize specific strategies across learning tasks. Ellis (1992) recommended that teachers (a) provide students with guided and independent practice (in addition to feedback) on a variety of learning tasks, (b) provide opportunities for students to discuss and elaborate on strategy adaptations, (c) facilitate generalization of goal-setting and positive learning attitudes, and (d) expect students to generalize, and (e) allow students to simulate or engage in specific and varied transfer activities.

Definitions and Examples of Terms

Semantic or Declarative Knowledge	Factual knowledge that one brings to a task (Alexander, Schallert, & Hare, 1991; Ellis, 1992) *Example(s)*: A student's existing knowledge about the properties of rocks and minerals can assist in a geology unit
Procedural Knowledge	"Knowledge one has of certain processes or routines" (Alexander, Schallert, & Hare, 1991, p. 33) The degree of familiarity one has for the specific steps in a given strategy (Ellis, 1992). *Example*: When using a paraphrasing strategy, a student's knowledge of the specific steps to follow in the strategy represent a type of procedural knowledge.

Definitions and Examples of Terms (continued)

Conditional Knowledge	Knowing when and where knowledge (either procedural or declarative) should be applied (Alexander, Schallert, and Hare, 1991) When and where to use a specific learning strategy (Ellis, 1992) *Example*: A student must know when to use a paraphrasing strategy across learning tasks (i.e., book reports, independent reading, studying for a test) and learning settings (i.e., in science, social studies, English classes).
Domain - Specific Knowledge	Knowledge that encompasses as specific field of study (Alexander, Schallert, and Hare, 1991) *Example*: Knowledge related specifically to the content area of mathematics, social studies, science, etc.
Prior Knowledge	The total knowledge an individual possesses and brings to an instructional task (Alexander, Schallert, and Hare, 1991) *Example*: All prior learning in mathematics would comprise a student's knowledge prior to learning a specific skill, such as multiplication of fractions.
Self-Regulation	Self-regulation occurs when a student monitors her own thinking and actions through language mediation. The term originates from Vygotsky 's notion (in Bos & Vaughan, 1988) that children first use language to mediate their actions by overtly engaging with others in the activities of self-regulation and self-monitoring. Through such experiences over time, children's regulatory language becomes internalized (i.e., covert). When using self-regulation, students "act as their own teachers" (Bos & Vaughan, 1988, p. 27). Accordingly, students take an active role in their own learning and assume responsibility for their learning. *Example*: A student learning cursive writing might be asked to judge the legibility of his handwriting through the comparison of his handwriting with a criterion model. The student might then circle those letters which do not closely approximate the criterion. Continuous self-monitoring of this nature may occur as the student progressively improves cursive handwriting skills.

Limitations/Barriers to Effective Use

1. *Terminology Problems*

Alexander, Schallert, and Hare (1991) effectively argued that researchers and practitioners alike have used a multiplicity of terms to define the construct of knowledge. This proliferation of terms, they asserted, has led to numerous loosely defined concepts of knowledge, with no conscious attempt to provide more precise definitions. Ramifications of using these ill-defined concepts include (a) an inadequate referential base upon which researchers and practitioners may communicate, and (b) a deleterious impact on research as findings may represent the idiosyncratic meanings researchers attached to their findings. Additionally, these authors asserted that the myriad forms of knowledge that are subsumed under the general rubric of knowledge (e.g., declarative knowledge, semantic knowledge) have been ill-defined as well. To bring a consensus to this field of study, Anderson, Schallert, and Hare reviewed the existing literature and provided numerous explicit definitions of the various forms of knowledge.

Organizing and Activating Knowledge

Principle 7: ***Learning is increased when teaching is presented in a manner that assists students in organizing, storing, and retrieving knowledge.***

Overview

Consider the following excerpt taken from Shavelson and Webb (1991):

> The expected observed-score variance reflects variability in the ordering of observations (relative standing). It ... is the sum of the universe-score variance plus relative-error variance. Contrast this with the total variance: ... a measure of the total variation in item responses and [it] reflects variability in absolute level of performance (p. 93)

For the many individuals, this excerpt is most likely incomprehensible. For those with expertise in the area of generalizability theory, however, the recognition of the relationship among various components of variance is easily recognized. This excerpt highlights the important role that prior knowledge plays in learning. Simply stated, the prior knowledge a learner brings to a task plays a central role in the acquisition of new learning (Beck, 1986). If a learner is unable to access prior knowledge, then the blocks upon which new learning can be built are unavailable.

According to Prawat(1989), the major goal of education is to promote the transfer of knowledge and skills. As defined by Prawat (1988), transfer is the ability to access one's own knowledge in situations in which that knowledge may be relevant. Thus, the ability to access and utilize one's prior knowledge effectively and efficiently should be a primary goal of education.

The inability to access prior knowledge may occur for three reasons. First, students may *lack* a sufficient knowledge base upon which to access information. Second, students may have *poorly organized* knowlege, and consequently, retrieval of this knowledge may be inhibited. Finally, unless one is aware that one *possesses* relevant knowledge and is cognizant of the *conditions* under which that knowledge is *relevant*, one will fail to access this knowledge, and thus prior knowledge will remain inactive or inert.

As reviewed by Jones, Palinscar, and Ogle (1987), there is considerable evidence that empowered learners have not only acquired a substantial knowledge based, but their acquired knowledge is better organized and integrated than that of novice or ineffective leaners. Additionally empowered learners, are able to *flexibly* access their knowledge to assist them in relevant problem-solving situations.

How do learners acquire and organize knowledge?

Various models of information processing theory have been proposed (Anderson, 1983; Quillian,1969). Each of these has attempted to describe the manner in which new sensory input is perceived, transformed, reduced, elaborated, stored, retrieved, and used (Bos & Vaughan, 1988). A simplified model offered by Swanson (1991) is presented in Figure 1. Very simply reviewed, external stimuli or input must first be presented to the learner. Next, information must be registered by the learner (i.e., perceived) via visual, auditory, olfactory, kinestheic, tactile, or oral receptors. Once perceived and attended to, the information moves to working short-term memory,(analogous to the work space on a computer) (Bos & Vaughan, 1988). Prior knowledge or information can assist learners in processing the new information in this mental work space. For example, prior knowledge of the words "cat" and "trophy" might assist us in decoding the new word, "catastrophic." Unfortunately, learners have only a limited capacity in working memory and, consequently, can store only small bits of information into working memory at any given point in time. Therefore, due to factors such as interference and decay, learners may loose information if intensive efforts are not made to store the information into long-term memory. The executive function assists in the development of various strategies that enable us to keep information in working memory until it can be transferred to long-term memory. Once transferred to long-term memory, information *may* or *may not* be retrievable or accessible in relevant situations. Retrieval is highly dependent upon the strategies used by the learner to process information (Bos & Vaughan, 1988).

Types of Memory

According to Brewer and Pani (in Bos & Vaughan, 1988), information is organized into three dynamically interactive types of memory (a) personal memory, (b) skill memory, and (c) semantic memory. Personal memory is the rememberance of a past episode which includes such representations as time and location. For example, many of us are able to vividly recall the details of our first date. Information stored in skill memory represents the memory for carrying out motor and/or cognitive operations (e.g., the procedures used to add digits with regrouping required, or how to drive a car). Semantic memory represents that information stored in terms of concepts or meaningful ideas.

Network Models of Memory

In semantic network models of memory, such as that proposed by Quillian (in Glover, Ronning, & Bruning, 1990), semantic knowledge is represented as a web or "network." In many of these models, networks are thought to be comprised of cognitive units referred to as **nodes** (schemas or concepts) and **links**, which represent the relations between each of the nodes. In his semantic network model of memory, Quillian (1969) proposed that memory could be represented as a hierarchical semantic network. In this semantic hierarchy, nodes are concepts aranged in superordinate-subordinate relationships. Figure 2 provides an example of Quillian's hiearchical network for a child's concept or schema of "dog." As can be seen in this figure, numerous links are illustrated. For example, suppose a child has been asked the following question: "Is a dog a mammal?" As depicted in Figure 2, the child's concept of dog might include such nodes as "animal", "mammal," "beagle," and semantic properties of the child's schema for "poodle," might consist of such descriptors as "is easily excited" and "has curly hair," etc. The information depicted in Figure 2 illustrates the hiearchical arrangement associated with the child's schema for "dog." That is, the child's schema might begin with the very global concept of "animal." Descending down the hierarchy, a more specific concept such as "mammal" might precede the child's concept of "dog." and so forth.

According to Glover, Ronning, and Bruning (1990), when memory is searched, activation moves along the links from the stimulated node (e.g., "dog"), and expands to all the nodes directly linked to the child's concept of "dog" (in Figure 1, from "dog" to the superoridnate concept of *mammal* and to the subordinate concept of *poodle*). As activation spreads throughout the nodes, the child is then able to find the intersection at which the question can be answered. Thus, both the number of nodes and linkages are important, but the strength of those linkages is critical in activating knowledge in potentially relevant situations.

Prawat (1989) stressed that cognitive organizational structure is provided by the connections or links between elements of the knowledge base. Prawat maintained that accesibility of prior knowledge is a function of the *strength* of these relational or associative links. Prawat argued that the promotion of relational understanding during instruction is imperative if educators are to increase and strengthen the linkages or connectedness in ideas (for additional information, refer to Principle 10, *Teaching Sameness in the Curriculum*) and thereby facilitate student organization and access of knowledge.

Assisting Learners to Activate Prior Knowledge

Learners can engage in numerous activities that can assist them in organizing, storing, and organizing knowledge. Swanson (1991) identified eight sequential stages of information processing in which the learner actively enages as information is processed. Very briefly presented in Figure 3, these stages are essential to organizing, storing, and retrieving knowledge. The degree to which the learner engages in each of these activities determines the accessibility and utility of the information in future problem-solving situations. Bos (1988) made the following statement: "Deep processing involves integrating new information with old and developing elaborated semantic networks" (p. 104). Thus, by engaging in these processing activities, the likelihood that information can be retrieved and utilized effectively is largely dependent upon the depth of processing in which learners engaged.

According to Glover, Ronning, & Bruning (1990), schema activation refers to "... an array of activities designed to activate relevant knowledge in student's memory prior to encountering new, to-be-learned information" (p. 251). Teachers can assist students in a number of ways that will assist them in activating their prior knowledge. Among these are use of instructional organizers, achoring instruction, content organizers semantic mapping, semantic features analysis, and anchored instruction. Each of these approaches are to be presented later in this section.

The Problem of Access Failure

Bransford, Sherwood, Vye, and Rieser (in Prawat, 1989) have reviewed numerous studies that suggest that it is *access failure*, not knowledge acquisition per se', that is often at the root of poor student performance. That is, while learners often have acquired information that will assist them in solving tasks, they do not always access this information in relevant situations. According to Pressley, Goodchild, Fleet, Zejchowski, and Evans (1988), this represents a problem of *durability.* Prawat (1989) concurred by pointing out that current research has blurred the distinction between knowledge acquisition and knowledge utilization. He has argued that students' ability to access knowledge varies markedly for two reasons. First, simply possessing knowledge is not enough. Acquired knowledge must be well-organized and well-linked. Second, unless one is aware of what one knows, knowledge will remain ***Inert.*** Several studies (Di Camillo & Phillips (in Bransford & Vye, 1989), 1978; Gick & Holyoak, 1989; Perfetto, Bransford, & Franks, 1983) have demonstrated that inert knowledge is a very real phenomenon that occurs when individuals are presented with novel problems. Potentially relevant knowledge that could assist individuals who participated in these studies was not accessed unless hints were provided to them.

The Role of Specific Knowledge

As noted by Glover, Ronning, and Bruning (1990), as students learn more about a *specific* topic, it is easier for them to learn and remember information. To highlight this point, consider the following situation.

> Sitting on his balcony which oversees the apartment complex parking lot, Scott notices his neighbor, Katie, approaching in her car. Katie very slowly stops the car in front of his balcony. In doing so, she has blocked several parked cars. Scott is intrigued as he watches Katie remain rigidly seated in her car, staring stragiht ahead. Her left arm is extended outside the opened driver's window as if giving a turn signal. Katie remains in this position for several minutes, unmoving. While observing Katie, a neighbor whose car is blocked, gets inside his car, and waits for Katie to move her car. Instead of moving, Katie very slowly and rigidly gets out of her car. Once outside, Katie frantically begins shaking her left arm. Shortly thereafter, she calmly returns to her car and drives away.

Most people may face difficulty in understanding Katie's peculiar behavior. Perhaps the first explanation many may give for her behavior is that she is having some sort of seizure. Not true. Had the reader had the very specific knowledge that a bee had flown inside the sleeve of Katie's blouse, her peculiar behavior becomes readily understandable. Glover, Ronning, and Bruning (1990) in their review of research, suggested that the lack of specific knowledge in learning situations has several consequences. Lack of specific knowledge may inhibit both comprehension and memory abilities. In the aforementioned passage, persons lacking *specific* knowledge about the goal of Katie's behavior would most likely have difficulty comprehending and recalling various aspects of the passage. Glover, Ronning, and Bruning (1990) concluded from their review that a great deal of research has suggested that the availablility of specific knowledge enhances the learner's ability to make inferences which serve to fill gaps in incoming information.

Teaching Conditional Knowledge

Bransford, Vye, Kinzer, and Risko (1990) have stressed the importance of specific content knowledge for thinking and problem solving. As they noted, a reasonable course of action would be for educators to teach content directly. While this solution appears rather simplistic and quite defensable, these researchers have stressed that educators must guard against teaching content in a rote, highly context-specific manner which increases the liklihood that knowledge will remain inert. Additionally, Bransford et al. (1990) have stressed that an extremely important aspect of learning involves knowing about the conditions under which knowledge is to be applied. In addition to teaching content directly, educators must teach **conditional knowledge** as well. Whitehead (in Bransford et al., 1990) claimed that our schools have been especially good at promoting inert knowledge which has resulted primarily through the lack of opportunities that would promote active application of declarative knowledge. Bransford and Vye have concurred by cited numerous studies which have demonstrated that when information is merely memorized, it will remain inert and fail to transfer to potentially relevant situations.

Real-Life Problem-Solving

Bransford et al. (1990) stressed the important role that "meaningfulness" plays in knowledge organization and acquisition. For example, many of us may have difficulty memorizing a random list of seven numbers, yet when these numbers are meaningful (e.g., telephone number of a close friend), we are able to recall them more readily through such strategies as grouping and rehearsal. Thus, implication for educators is that both organization and recall of knowledge abilities are enhanced when content is presented within meaningful contexts.

Cognitive Rigidity and Flexibility

Westman (1990) distinguished between the terms cognitive rigidity and cognitive flexibility. Westman stated that cognitive rigidity refers to "... fusing images of present and past information so that a few narrow categories are imposed upon new information with reliance upon concepts that are concrete and bound to the physical properties of stimuli" (p. 257). As a result of cognitive rigidity, behavior is not effeciently adapted to situational changes. In contrast, Westman refers to cognitive flexibility as the ability to differentiate "... present from past information and employing broad abstract categories related to the functional properties of stimuli and resulting in behavior that is adaptive to changing circumstances" (p. 257). Westman described cognitively flexible children as verstaile learners who vary their strategies according to task demands. Child with rigid cognitive styles may be able to activate their knowledge only is very specific contexts, namely those which closely resemble the original learning situation.

Bereiter and Scardmalia (1985) have stressed that instruction designed to teach both knowledge acquisition and utilization will inevitably fail if direct efforts are not made to provide students to use their acquired knowledge flexibly in solving a variety of real-life problems. An excellent illustration, provided by Bereiter and Scardamalia (1985) is the cognitive flexibility that one must employ when deciding where to vacation. Knowledge of geography, current events, personal finances etc. are only a few of the knowledge sources that must be accessed and utilized flexibly in making a decision of this nature. As addressed by Bereiter and Scardamalia (1985), flexible accessing of knowledge characterizes most real-life problems. These researchers have argued that most school tasks do not pose the kinds of knowledge access demands that tasks in everyday life necessitate.

Cognitive rigidity is promoted when learning is embedded within the context of very specific cues than inhibit the flexible memory searches that real-life problem solving requires. For example, many of us can recall instances in which we studied just enough to "get the correct answer" on a test while remaining unable to utilize that information in real-life situations. For some of us high-school algebra comes readily to mind. While "getting the answer correct" was certainly an adaptive (and at the time, effective) strategy, formal algebra may never be accesssed to solve real-life problems. Bransford and Vye (1989) refer to this adaptive behavior as a type of "knowledge-telling strategy" and assert that it is characteristic of the kind of strategies many children employ in school. That is, the strategy is virtually worthless for any situation other than for meeting many school requirements. The use of knowledge-telling strategies, according to Bransford and Vye, highlight the manner in which children can effectively manipulate and encode conditional knowledge in a manner that serves the short-term purpose of "getting by." Bransford and Vye believe that these coping strateiges serve to keep knowledge inert. They cited the following instructional practices which promote inert knowledge (a) testing only on content taught in a course, (b) presenting test items in an order corresponding to the temporal sequence of topics presented in a course, (c) teaching concepts in a hiearchical fashion, (d) referring to content by temporal connections, (e) assigning papers on a single topic, and (f) passing students who actually do not effectively address presented problems but who have shown they learned something in the course.

Addressing Informal and Intuitive Knowledge During Instruction

The informal or intuitive knowledge which a learner brings to the task may also impact upon knowledge oragnization acquisition. Studies conducted by Anderson and Smith (1984) highlight the misconceptions which students bring to tasks and the failure of textbooks to correct those misconceptions. Roth's (1985) studies of various effective and ineffective strategies which children employ when reading science textbooks suggested that (a) some students rely almost exlusively on their prior knowledge when completing assigned activities, virtually ignoring the information they read, (b) some students over-relied on words in the text to complete their assigned activities; (c) some students relied too heavily on prior knowledge and frequently distored textual information to make it congruent with their prior knowledge, (d) some students simply memorized textual facts, and (e) some students changed their prior knowledge so that it conformed with the information provided by the text. Results from this study are important to note as strategy (e) was the only strategy which children employed which resulted in reconstructive conceptual changes of knowledge. While the first four strategies may or may not have been effective in "getting the assignment" done, no new knowledge was acquired by any of those students who employed them. As concluded by Bransford and Vye (1989), if students persist in using the wrong strategies, no new learning is possible and informal knowledge which may be replete with misconceptions remains uncorrected.

Techniques and Methods to Facilitate Knowledge Acquistion, Activation, and Utilization

Bransford et al. (1990) cited several ways in which teachers can facilitate the acquisition and utilization of prior knowledge.

1. *Incorporating Conditional Knowledge into the Content Instruction*

   Teachers can assist students in examining the conditions in which both prior knowledge and new knowledge are useful. By providing varied opportunities for students to solve meaningful real-life problems using their knowing, teachers are increasing the potential for knowledge to be organized, stored, and transferred to relevant situations.

2. <u>Assisting Students in Distinguishing Between Knowledge Acquisition, Activation, and Utilization</u>

Bransford et al. (1990) asserted that st.idents need to be taught to understand the fundamental difference between "knowing X" and "thinking to use X" (p. 390) in novel situations. Students need to be instructed directly in order to discern the very important distinctions between the two.

3. <u>Providing Students with Opportunities to Solve a Variety of Problems from Different Perspectives</u>

As addressed by Bransford et al. (1990). students need to learn to take a variety of perspectives in problem-solving situations. By adopting various perspectives, students will increase the probability that they can use their prior knowledge to solve relevant problems. For example, rather than simply teaching algebraic algorithms, teachers can plan instructional opportunities for students to apply the algorithms in various situations, enabling them to gain numerous perspectives.

4. <u>Curricula materials should be designed from multiple perspectives</u>

The manner in which we teach content does not faciliate cognitive flexibility. Bransford et al. (1990) stated:

> Traditional curriculs are organized so that science, mathematics, reading, writing, and so forth all tend to be taught in different contexts rather than integrated into single contexts. (p. 390).

By integrating content instruction, cognitive flexibility can be promoted. To be addressed in the next section, integrative instructional methods, such as anchored isntruction, provide particular promise for teaching cognitive flexibility.

Bos and Vaughan (1988) have emphasized the necessity of selecting major concepts and related vocabulary prior to instruction. Once selected, a framework should be designed by the teacher to faciliate the concepts to be learned. Both schema and scaffolding theories suggest that teacher should design instruction that facilitates the scaffolding process while simultaneously ensuring that the relationships among concepts is carefully delineated. To-be-learned material should be presented in a manner that activates prior knowledge and that assists the learner to organize and process the knowledge effectively. As suggested by Bos and Vaughan, major concepts are best understood when succinctly articulated to students.

Instructional Techniques that Promote Knowledge Acquistion, Organization, and Retrieval

Instructional organizers, anchoring instruction, study guides, content organizers, semantic feature analysis and semantic mapping are examples of instructional techniques that can assist teachers in presenting major concepts, ideas, and vocabulary in a manner conducive to knowledge acquisition, organization, and retrieval.

Semantic Features Analysis

According to Bos and Vaughan (1988) semantic features analysis (SFA) "...is a prelearning activity that serves to organize the major concepts and related vocabulary to be taught..." (p. 193). SFA assists the students in recognizing relationships between prior knowledge of the material, major concepts and ideas presented, and related vocabulary. Closely aligned with schema theory (Rumelhart, in Bos and Vaughan, 1988), SFA is an empirically validated technique for assisting students to organize and retrieve acquired knowledge (cf. Bos & Vaughan, 1988). To prepare a SFA activity, the teacher must first develop a relationship chart which depicts the relationships of central ideas or concepts. Superordinate concepts (i.e., the most inclusive or abstact concepts or ideas) and subordinate concepts (i.e., more specific, narrow concepts or ideas) are determined. Additionally coordinate concepts (those that fall somewhere between superordinate and subordinate concepts) are selected and placed on the relationship chart. Once depicted, the relationships between the concepts are discussed and related to the students' background knowledge. After reviewing the relationship chart, students then read or complete the assigned activity to confirm or disconfirm their the relationships between terms (Bos & Vaughan, 1988).

As an illustrative example, consider the relationship chart depicted in Figure 4 which requires psychology students to engage in an evaluation activity of various theories of personality. This activity designed to promote students' sythesis and critical evaluative abilities by using six theoretical evaluation criteria identified by Liebert and Spiegler (1990). The superordinate concept, "Evaluation of Personality Theories" is placed at the top of the figure. The subordinate concepts (the theories) are listed down the left-hand side of the relationship chart, and the coordinate concepts (i.e., the evaluation critera) are placed as column headings.

A teacher might begin the course by reviewing the six evaluation criteria. As instruction in the major concepts of various personality theories are presented during the course, students can evaluate each of the theories, using each of the six criteria, to determine their own personal evaluation of the personality theories. Such an activity requires a more abstract level of processing than might be required had this semantic features analysis activity not been provided.

Content Organizers

Teachers can make the organization of content subject matter e. to students, thus enabling them to organize, store and retrieve their knowledge more easily. Various forms of graphics provide visual displays of a subject matter's organization of structure (e.g., charts, diagrams, etc.). Figure 5 provides an example of a graphic organizer that assists students in understanding the relationship among kings, knights, and serfs in a feudal society (Ellis & Friend, 1991). From examination of this graphic organizer, the reader can discern easily the critical features of each of these persons. Graphic organizers have been referred to as "figural taxonomies" (Scruggs, Mastropieri, Levin, McLoone, Gaffney, & Prater, 1985). Such figural taxonomies are graphics that display superordinate, subordinate, and coordinate relationships among concepts, facts, and details, or some combination thereof. Graphic representations make material more learnable because students can extract the information from texts that are poorly structured and organized. Several research studies have demonstrated the efficacy of graphic organizers in promoting students learning (Bergerud, Lovvitt, & Horton, 1987; Koran & Koran, 1980; Moyer, Sowder, Threadgill-Sowder, & Moyer, 1984).

Content diagrams can also be effectively used as organizational devices when teaching students complex abstract concepts (Bulgreen, Scumaker, & Deshler, 1988). Figure 6 presents a concept diagram depicting the critical features of maintaining a healthy life-style. These critical features are depicted in conceptual categories, characteristics, examples and non-examples. Such a diagram promotes student understanding and memory of the superordinate concept of "healthy living."

Study Guides

Teachers can cue the organization of information by using structured study guides. Such guides are comprised of a set of statements or questions designed to accompany reading assignments and class lectures (Ellis & Friend, 1991). Study guides can be utilizied in various ways. Two approaches commonly used are (a) giving the student the study guide to use as s/he independently completes an assignment and (b) requiring the student to first read the passage and then providing the study guide. In the latter example, the teacher directs a dicussion of the questions from the study guides while using an overhead projector. Typically, the discussion is then followed by a short text on the presented information. The latter technique is a teacher-mediated use of a study guide (i.e., the teacher mediates the student's use of the study guide).

Three common types of study guides are (a) multi-level guides, (b) concept guides, and (c) pattern guides (Horton & Lovitt, 1987).

(a) *Multi-level guides*

Multi-level guides are designed to address literal, interpretive, and applied levels of comprehension. In a study undertaken by Horton and Lovitt (1987), results suggested that the the teacher-mediated study guide approach (described above) was superior to the self-study guide approach.

(b) *Concept guides*

Concept guides are designed to make new information more memorable by facilitating conceptual links or association between the new information and that previously learned material.

(c) *Pattern guides*

Pattern guides are designed to enable the student to recognize patterns of information (e.g., sequence, compare/contrast, enumeration, cause and effect).

Instructional Organizers

Ellis & Friend(1991) defined instructional organizers as "... teaching routines used to help students understand what is being learned and to integrate new information with that which is previously learned"(p. 96). Additional advantages of instructional organizers cited by Ellis include (a) helping students to distinguish between important and unimportant information, and (b) assisting students to store the new information in an organized manner which enhances future retrieval. As reviewed by Ellis (1991), research has demonstrated that instructional organizers are especially effective with ineffective learners, particularly when they are *specifically* instructed to take advantage of them.

Ellis (1991; 1992) identified three types of instructional organizers that have received empirical support for helping students to recognize the organizational patterns of instruction and which assist them in knowledge acquisition, organization, and retrieval: (a) advance organizers, (b)lesson organizers, and (c) post organizers.

(a) Advance Organizers

An advance organizer as defined by Ausubel and Robinson (1969) is "... material that is presented in advance of and at a higher level of generality, inclusiveness, and abstraction that the learning task itself" (p. 606). Although no operational definition of advance organizers has been agreed upon to date, Lenz, Alley, and Schumaker (1987) identified the following elements of advance organizers: (a) information about the benefits of the organizer is presented prior to instruction, (b) information that identifies the topics and subtopics to be covered in the lesson is provided, (c) information regarding the physical acts that the learner must perform to accomplish the task is provided, (d) explicit efforts are made to related background information to the present to-be-learned information are undertaken, (e) the concepts to be learned are explicity identified, (f) examples (or clarification) of the to-be-learned information is presented, (g) the organization or sequence of the to-be-learned information is presented, (h) motivation is addressed, (i) new or relevant vocabulary is introduced, and (j) expected outcomes for learners are communicated.

Advance organizers (Ausbel & Robinson, 1969) are based upon schema theory and provide students with a needed framework to organize information. As described by Ellis and Lenz (1992), advance organizers are provided at the beginning of the lesson. During the presentation of the advance organizer, the teacher should (a) cue students that an organizer is being provided, (b) review previous learning, (c) review critical prerequisite skills associated with application of the new skill, (d) present the topics and goals of the upcoming lesson, (e) inform students of the relevance of the lesson and describe how the to-be-learned information will be useful, and (F) clearly delineate the expectations of the lesson.. In essence, the teacher when using an advance organizer should:

Tell students *what they are going to learn*

Tell students *why it is being learned*

and

Tell students *what they will be doing to learn it* (Ellis, 1992).

Lenz (1983) identified the steps in developing an advance organizer. These stages, depicted in Figure 7, will assist the teacher in developing and utilizing the advance organizer in a variety of content areas.

In a review of research on advance organizers, Mayer (1979) drew the following three conclusions:

1. Advance organizers improve learning, although their efficacy diminishes when (a) material is familiar to students, (b) when students have extensive prior knowledge of the material, and (c) when working with students with high ability.

2. Advance organizers are particularly beneficial to students with low ability or students who possess limited background knowledge of the material.

3. Advance organizers are most effective when presented prior to instruction.

(b) Lesson Organizers

During the lesson, teachers can use a variety of organizers to assist students in understanding the structure of the lesson. Several lesson organizers described by Ellis (1991; 1992) include:

Using organizing words (such as "*First*," "*Second*," "*Third*," etc.; "There were *four* primary causes for the Civil War.") during instruction.

Using explicit words to cue students that the information being presented is critical (e.g., "This is important, let's go over it one more time). Explicit cueing enable students to distinguish important from superfluous information.

Using explicit cues to help students to draw important relationships, associations, and to integrate previously learned and new information (e.g., "Let's use the information you have learned about fractions to identify similiar concepts related to the use of decimals.").

Making expectations explicit to students. Although expecations should have been communicated explicitly during the advance organizers, teachers can refer students back to those expectations as new information is presented. By doing so, students are cued regarding how expecations are related to instructional goals and mastery requirements.

(c) Post Organizers

Post organizers are designed to provide closure to a lesson. Teaching can assist students in gaining closure to the lesson by:

Cueing them that a post organizer is presented (e.g., "I'm now going to give you a post organizer which summarizes the major concepts and ideas of our lesson today."

Evaluating students to see if they have assimilated the new information. Evaluations can be formal or informal, oral or written. Such evaluations should be directly tied to the goals stated during the advance organizer.

Discussing with students how the informatin learned during the lesson can be used in relevant situations (e.g., "We can use the skills we have acquired in determining percentages to caculate the amount of interest we would be expected to pay when we finance a car."). Discussions of this nature faciliate transfer and generalization of the knowledge.

Forecasting learning to-be-acquired in future lessons (e.g., ("Now that we have learned the "c" sound, tomorrow, we will learn the "s" sound. As we shall see, these two consonants sometimes are pronounced alike, and sometimes their sounds are different."). Such forecasting allows provides students the needed organizational structure for the future lesson, and also may assist them in connecting relationships among concepts (Ellis & Friend, 1991).

Anchored Instruction

Anchored instruction (Bransford et al., 1990) is a relative new and innovate approach that "anchors" or immerses instruction in rich learning macro-contexts that permit active student problem solving, exploration and discovery. The goal of the anchor in instruction is to

> ... enable students to identify and define problems and to attempt to construct their own ideas about problems to be solve and strategies to solve them. ... The major goal of anchored instruction is to let students experience the changes in their perception and understanding of the anchor as they view the situation from multiple points of view. (Bransford et al., 1990; p. 391)

Philosphically embedded in the philosophy of Dewey and Hanson (in Bransford et al., 1990), anchored instruction provides students with opportunities to experiece and reflect upon their changes in perception and understanding, much like the expert in a particular discipline. For example, as new information and research is undertaken, an anthropologist, being immersed in his/her field of study may alter (and is consciously aware of doing so) his/her perception or views regarding human evolution. Similarly, achored instruction is designed to immerse students in an anchor that promotes an analogous awareness of changes in perception and understanding. Once immersed and reflectivity has been realized, learners can use the learning acquired in bridging the anchored contexts to other relevant contexts.

The Young Sherlock Holmes Project (Bransford et al., 1990) is a prototypical example of anchored instruction. This on-going project assisted 5th-grade students in learning the skills of problem-finding, problem-solving and reasoning while learning instructionally-relevant content. Social studies, language arts, and science content were integrated within the context of the movie, Young Sherlock Holmes. Some of the features of this project included:

1. Being a Detective versus Learning the Facts about a Detective

Students were asked numerous questions to check the authenticity of the movie. Questions related to dress and transportation during the Victorian England area were posed to students. To answer the numerous questions asked, students had to research and integrate information from a variety of information sources. As reported by Bransford et al. (1990), students had to categorize clues provided according to sociological, technological, economic, political, scientific, and geographic information.

2. Evaluating Accuracy and Communicating Ideas

Students were encouraged not only to verify the accuracy and authenticity of the movies, but were expected to share their findings with their peers as well.

3. Writing Well-Informed Stories

Using the Holmes anchor, students engaged in numerous writing activities that included learning about the structural elements in writing.

Experimental research conducted by the developers of the Holmes anchor project (Bransford et al., 1990) showed that anchoring promoted long-term retention, spontaneous usage of vocabulary, improved written expression, and recall of historical information. The authors of this study concluded that the Holmes anchor helped those participating in the project to integrate knowledge that otherwise might have been taught in a piecemeal fashion.

Semantic Mapping

Semantic mapping is an instructional technique used to categorically structure information in graphic form (Johnson, Pittelman, & Heimlick, 1986). This instructional technique is used to assist students in relating new information with their own experiences and prior knowledge (Johnson & Pearson, 1984). Semantic maps are prelearning activities that assist students in activating prior knowledge and in seeing the conceptual relationships between prior knowledge and the to-be-learned information (Bos & Vaughan, 1988).

Comprehension, according to Pearson and Johnson (1984) is a bridging of new and old information. Semantic mapping is an instructional technique which promotes the conceptual and organizational bridging of new and old information. Johnson, Pittelman, and Heimlich (1986) outlined the instructional sequence when using semantic maps:

Step 1: Choose the major concept or word cental to the topic-at-hand.

Step 2: Write the word/concept on the chalkboard or overhead transparency.

Step 3: Engage students in brainstorming words related to the concept or central word. List these words by categories on the chalkboard.

Step 4: Have the students individually and independently generate as many words that are related to the concept or central word. Then have the students list these words in categories.

Step 5: Have students share their lists and add to the semantic map.

Step 6: Have students generate categorical labels for the semantic map.

Step 7: Engage students in class discussion about the labels, encouraging them to become aware of the new words, derive new meanings from old words, and draw relationships among words on the semantic map.

Rewey, Danseareay, Dees, Skaggs, and Pitre (1991), in their study, provided evidence of the efficacy of mapping techniques. One cautionary note offered by these researchers is that they while they map may enhance main or central ideas, they eliminate sometimes essential details.

Figure 8 presents an illustrative example of a semantic map which a junior high school baseball coach might use in depicting the various fielding basics and tactics for various playing positions. When introducing fielding basics and tactics, the baseball coach could follow the procedures outlined above by Pearson and Johnson (1984). When working with individual players, the coach could schematically represent in greater detail the various fielding basics of throwing and catching and tactics by position (rather than by team) to outline the information/procedures to be conducted during baseball practice.

Limitations/Barriers to Effective Use

1. *Teaching Inflexibility in Planning*

Once the teaching plan has been made, many teachres appear to be inflexible; their plans tend to be made early in the year, and subsequent changes are rarely made (Anderson & Evertson, 1978; Brown, 1988). Teacher inflexibility may be due to inability to efficiently process a wide array and quantity of information produced during ongoing classroom instruction (Clark & Peterson, 1986). Brophy (1984) noted that teachers are reluctant to change their routines even when they are not working well because established routines tend to reduce the complexity of teacher planning. Another reason why teachers over-rely on established routines is because they have limited knowledge of effective and efficient alternative routines. Morine-Dershimer (1979) noted that when instructional routines are not working, the strategy most teachers use is "Postponement" -- in other words, they either abort the lesson or move ahead with their original routine even though it is not working.

Lenz et al (1988) drew several conclusions from the teacher-thinking and planning research. First, teaching is a complex task that requires a good deal of planning and decision making, yet few teachers are expert enough to function as effective decision-makers in light of the wide range of content and method selection, adaptation, supplementation, evaluation, remediation and adjustment of plans and the manner in which decisions become even more convoluted when having to consider the various learning needs of academically disabled students. Second, teachers are not always responsive to unexpected problems and needs of students during class routiones, therefore instructional procedures that address the needs of academically disabled students may best be conceptualized through the development of routines and devices that promote effective and efficient information-processing in students that can be readily incorporated into teachers' planning and teaching processes. Fourth, instructional practices should include procedures that promote student ownership and control of the instructional process since one goal of instruction is to make students independent learners. This can be addressed by viewing teaching more as a collaborative process between teachers and students. Fifth, teachers must be instructed in pedagogy based upon information-processing and decision-making and in the appropriate use of the pedagogy.

2. *Lack of Teacher Preparation*

Information processing theories and related teaching methods and techniques are areas of teaching that require extensive teacher education preparation. Techniques, such as anchored instruction, require relatively extensive teacher education to implement effectively. More teacher education at both pre-service and in-service levels is needed for teachers to develop the competencies required to implement many instructional techniques/ approaches based upon information processing research.

3. *Lack of Teacher Time*

Development of materials such as content organizers, study guides, instructional organizers, etc. may tax the time of the already overburdened teacher. Curriculum publishers and developers can help to alleviate this problem by including these techniques and methods in the materials they publish/develop.

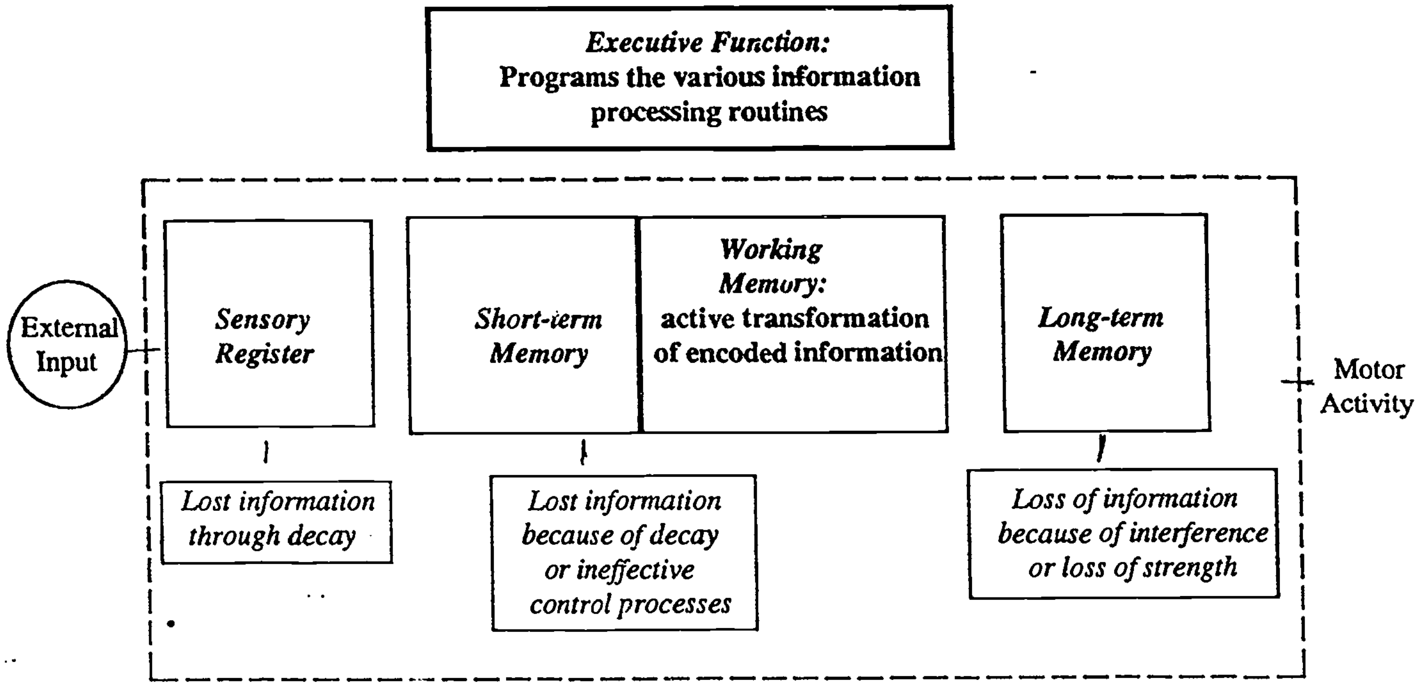


Figure 1. A simplified model of processing.

Source: Swanson, H.L. (1991). Information processing: An introduction. In D.K. Reid, W.P. Hresko, & H.L. Swanson (Eds.), *A cognitive approach to learning disabilities* (2nd ed.). Austin, TX: Pro-Ed.

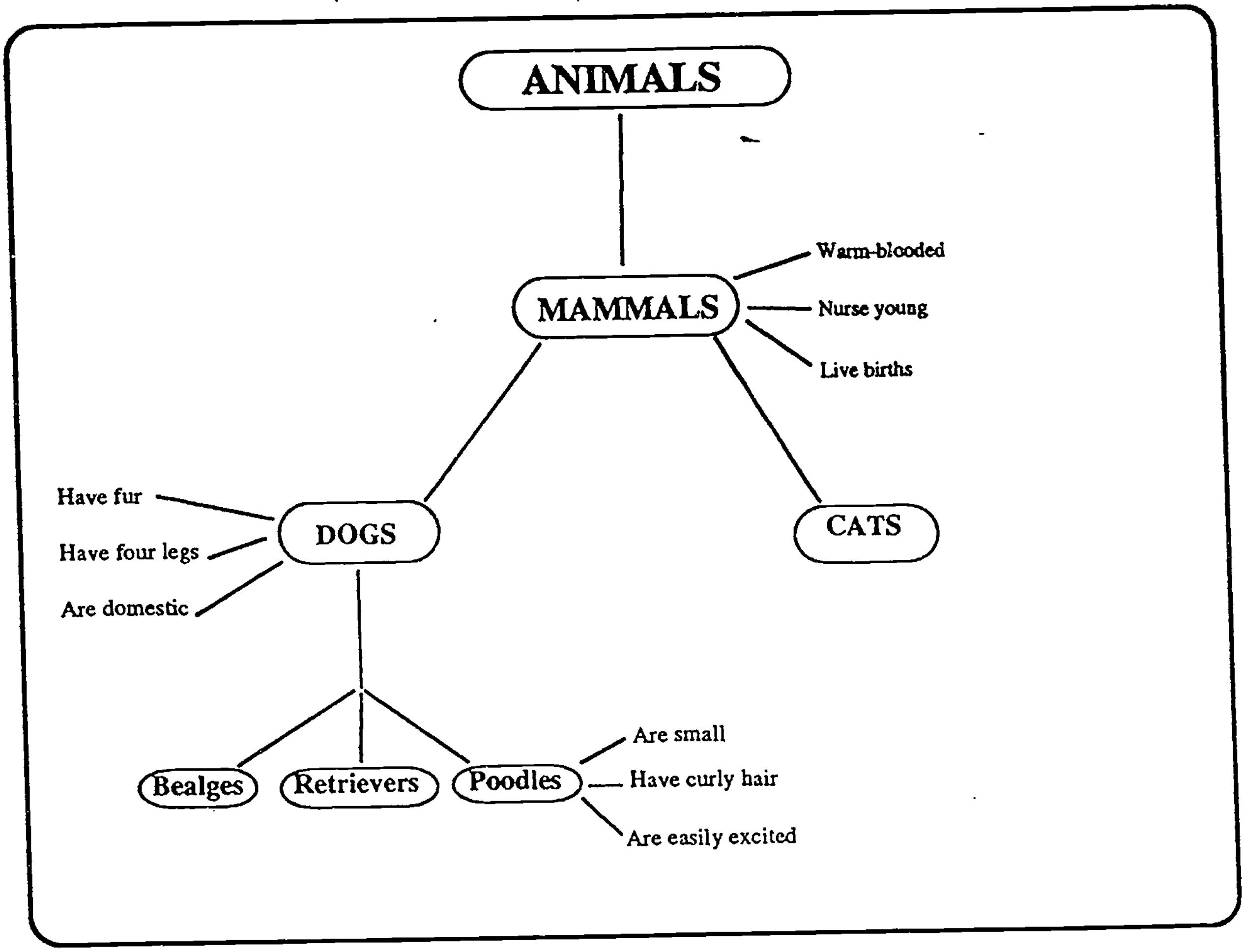


Figure 2. A semantic network model of memory.

Note: The above representation is modeled after the work of Collins and Quillian (1969).

Figure 3. Stages of Information Processing

Stage 1: Encoding

Encoding is "...the process of analzying information at the point of input. During this stage, the child matches the input with past learning, which involves processing different types of information about the stimulus. For example, Swanson stated that a child given a list of spelling words may process the words by their orthographic features, their phonological features or their semantic features.

Stage 2: Elaboration

Elaboration, according to Swanson, is the process of "...making connections between the material to be learned and information previously stored" (Swanson, p. 134). For example, to assist with learning spelling words, the pupil may use form associations to the words by using the following mediationg techniques: visual imagery; asking and/or answering questions to self about the distinctions, categorizing information, or associating the word with a context.

Stage 3: Transformation

Transformation is the "...process of applying rules to incoming information..." (Swanson, 1991; p. 134). For example, when writing an essay, the pupil applies capitalization and punctuation rules. According to Swanson, the transformation stage differes from the encoding and elaboration stages in that transformation necessitates that previously stored rules are applied to the incoming information.

Stage 4: Storage

Storage is the "...process of adding input information to the existing information within the mental system" (Swanson, 1991; p. 134).

Stage 5: Retrieval

Retrieval, according to Swanson, is the process of activating prior information.

Stage 6: Searching

Searching is the "... process of accessing information by determining the presence or absence of additional properties" (Swanson, 1991; p. 134).

Stage 7: Comparing

The comparing process entails the comparing new information with previously stored information and recognizing that the information is old, new or different.

Stage 8: Reconstruction

Reconstuction is a process whereby recalled information is modified in some manner from the original presentation. According to Neisser (in Swanson, 1991), information recall is not a duplicate of the encoded information.

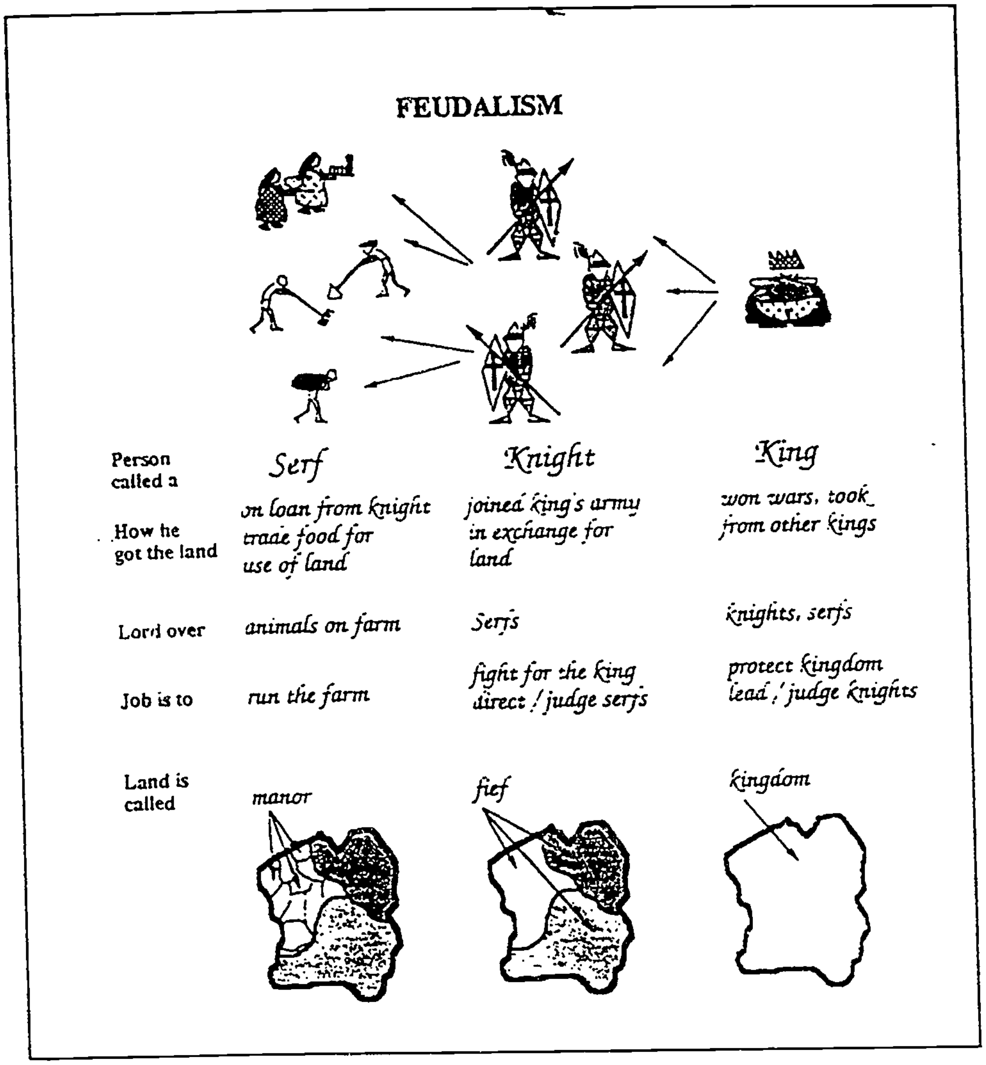
Source: Swanson, H.L. (1991). Information processing: An introduction. In D.K. Reid, W.P. Hresko, & H.L. Swanson (Eds.), *A cognitive approach to learning disabilities* (2nd ed.). Austin, TX: Pro-Ed.

EVALUATING PERSONALITY THEORIES

Evaluation Criteria

Theory	Empirical Validity	Extensiveness	Internal Consistency	Testability	Usefulness	Acceptability
Pscyhoanalytic						
Behavioristic						
Social Learning						
Humanistic						
Cognitive						
Psychometric						
Dispositional						

Figure 4. Illustrative Example of a Relationship Chart using Semantic Features Analysis



Ellis, E.S. & Friend, P. (1991). Adolescents with Learning Disabilities. In B.Y.K. Wong (Ed.). *Learning about learning disabilities* (p. 529).San Diego: Academic Press.

Figure 5. Example of a graphic organizer.

CONCEPT: *Healthy Life Style*

Definition

Behaving in a way that promotes physical, mental, and social wellness and longevity

Characteristics

ALWAYS	SOMETIMES	NEVER
exercise	*sometimes your behavior reflects a healthy life style, sometimes it doesn't*	*things in excess*
proper diet	*sometimes you get sick anyway*	*sedentary life*
positive attitude	*switching to a healthy life syle happens too late to make a difference*	*high fat diet*
positive interaction	*people with unhealthy lifestyles experience good health & longevity*	*negative attitude*
goal setting	*view stressful situations as "challenges" / sometimes as "problems"*	

Examples	Non-Examples
swimming	*watching a swimming match on T.V.*
eating baked chicken	*eating fried chicken*
"I can" "I'm challenged"	*"I can't" "I'm defeated"*
discuss the pros & cons	*argue*

Figure 6. Example of a content diagram.

Step 1: Inform students you are providing an advance organizer
- Announce the advance organizer & state benefits
- Suggest that students take notes on the advance organizer

Step 2: Identify the Topics/Tasks to be completed
- Identify major topics or activities
- Identify subtopics or component activities

Step 3: Provide students with an organizational framework
- Present an outline, list, or narrative of the lesson's content

Step 4: Clarify Actions to Be Taken
- State teachers' actions
- State students' actions

Step 5: Provide students with background information.
- Relate topic to the course or previous lesson.
- Relate topic to new information.

Step 6: Specifically state the concepts to be learned.
- State specific concepts/ideas from the lesson.
- State general concepts/ideas broader than the lesson's content

Step 7: Clarify the concepts to be learned.
- Clarify by examples or analogies.
- Clarify by nonexamples.
- Caution students regarding possible misunderstandings

Step 8: Motivate students to learn.
- Point out relevance to students.
- Be specific, short-term, personalized, and believable

Step 9: Introduce vocabulary to students.
- Identify the new terms and define.
- Repeat difficult terms and definitions.

Step 10: State the outcomes desired.
- State objectives of instruction/learning.
- Relate outcomes to test performance.

Figure 7. Steps in Developing an Advance Organizer

Source: Lenz, B.K. (1983). Promoting active learning through effective instruction. *Pointer*, 27(2), 12.

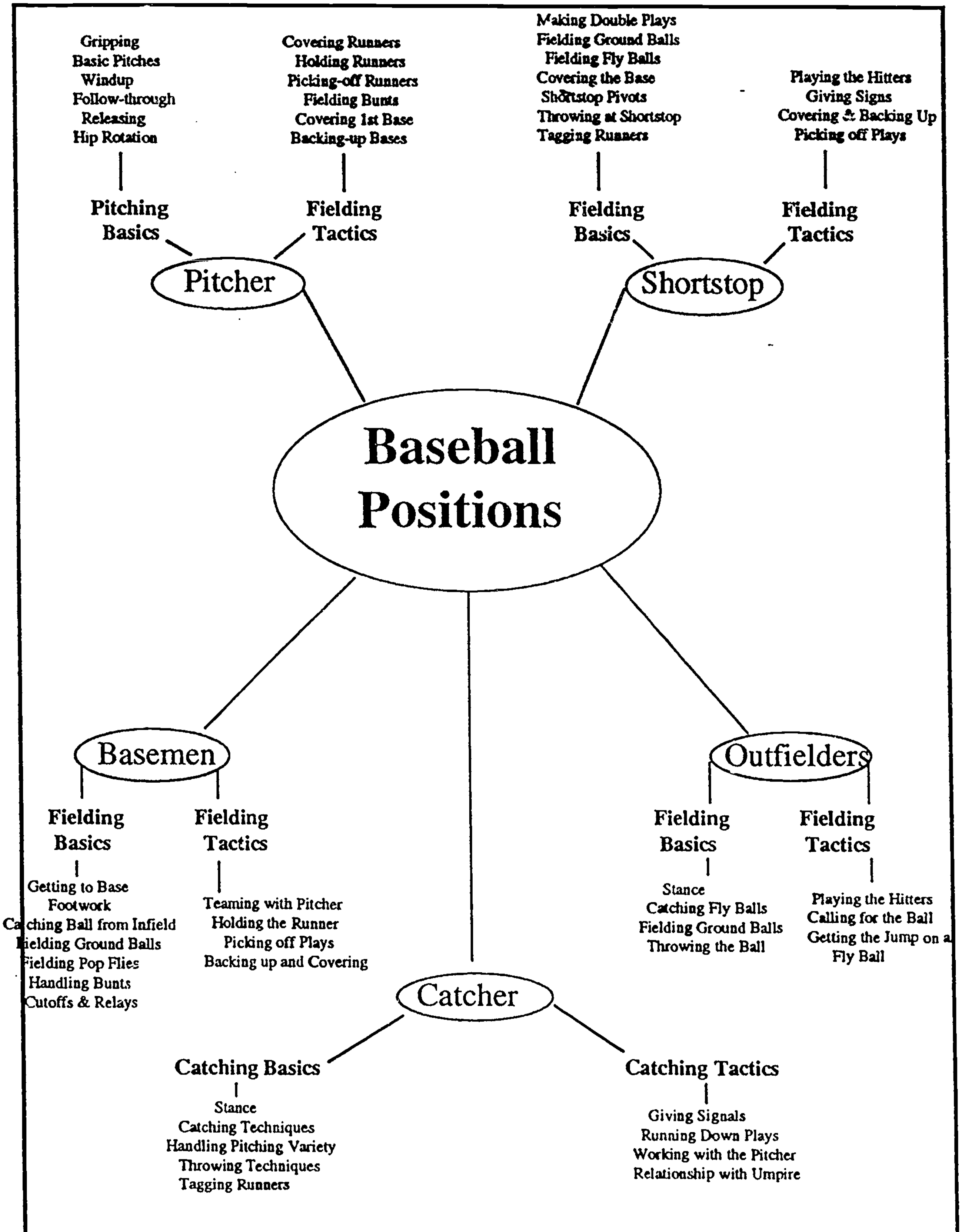


Figure 8. Semantic Representation of Baseball Positions.

Teaching Strategically

Principle 8: ***Students can become more independent, self-regulated learners through strategic instruction.***

Overview

Strategic instruction, a cognitive-behavioral modification approach derived from operant, social, and cognitive learning theories, assumes that students' thinking processes, like observable behavior, can be altered through mediation. A strategic approach to teaching is *not* designed to teach content, but rather is designed to enable students to use their existing knowledge in an optimal fashion when learning content. That is, strategic instruction is designed to teacher students "how to learn" effectively (Deshler, Schumaker, & Lenz, 1990; Schumaker, Deshler, Alley, Warner, & Denton, 1982). Effective strategic instruction involves the teaching of strategies to students that will enable them to successfully and independently accomplish academic tasks. Within the last ten years, there has been substantial research support for strategic instruction in improving student performance and achievement (cf. Harris & Pressley, 1991).

Expert-Novice Research

Numerous research studies have identified the characteristics of expert and novice (i.e., new or ineffective) learners (cf. Prawat, 1989; cf. Harris & Pressley, 1991). This research has suggested that these two groups of students approach their learning in strategically different ways. "Expert learners are aware of, and control, their efforts to use particular skills and strategies" (Jones, Palinscar, Ogle, & Carr, 1987, p. 14). This awareness includes the effective use of both procedural and conditional knowledge. That is, these students are not only knowledgeable about *how* to use specific cognitive strategies, but also, are knowledgeable about *when* strategies should be used. Other characteristics of expert learners identified by Jones et al. (1987) are that they: (a) are able to access particular strategies with flexibility, and (b) develop a repertoire of effective cognitive and metacognitive learning strategies spontaneously as they progress through school without special interventions.

In contrast, novice learners do not appear to have a repertoire of the basic cognitive and metacognitive strategies needed to assist them in learning (Jones, 1986). In studies such as that conducted by Winne and Marx (1982), research has suggested that irrespective of student ability, students who are able to articulate specific cognitive strategies perform better than students who are able to only express general, somewhat vague, strategies. Furthermore, the student strategy processes appear to be very good predictors of student achievement (Winne & Marx, 1982).

Research has indicated that novices and poor readers apparently do not develop a strategy repertoire spontaneously nor do they exhibit strategy flexibility, detect their errors, or effectively problem-solve (Jones, 1986). In the area of reading, research suggests that ineffective readers, once basic skills are mastered, have difficulty integrating subskills that facilitate comprehension, and they continue to encounter difficulty with syntax (Santos, 1989). Schuler and Perez (1987) and Jones (1986) maintained that many low-achieving students and those with disabilities (e.g., learning disabilities and behavioral/emotional disorders) are being viewed increasingly as having cognitive disabilities which revolve around poor planning, organization, self-checking, and problem-solving in metacognition, primarily because they are seen as passive learners who lack effective problem-solving strategy repertoires. Several researchers (e.g., Sheinker, Sheinker, & Stevens, 1984) have suggested that strategy instruction holds much promise for assisting learning disabled and other low-achieving students to reach their full potential.

Definition of a Strategy

According to Deshler and Lenz (in Lenz, 1992), a strategy is "... an individual's approach to a task; it includes how a person thinks and acts when planning, executing, and evaluating performance on a task and its outcomes" (p. 143). Schunk and Rice (1992) defined learning strategies as systematic "plans" that assist learners in encoding information and performing tasks. Such strategies, as addressed by Schunk and Rice, enable students to engage in the following self-regulatory activities: (a) attending to tasks; (b) focusing on relevant features of the task; (c) rehearsing information; (d) elaborating on information; (e) monitoring their levels of understanding; (f) taking corrective action, if needed, (g) cueing them to retrieve information, and (h) helping them to maintain a favorable emotional climate that is conducive to learning.

Ellis (1992) and Wong 91991) distinguished between cognitive and metacognitive strategies in the following manner. Cognitive strategies are the "tools" one used for solving specific types of problems across a variety of situations (e.g., an outlining strategy). Metacognitive strategies are the processes one uses to figure out which cognitive "tool" is needed, which one to select, to evaluate how it works, and to determine if another strategy is needed (e.g., determining if note-taking is effective).

Derry (1990) described the following characteristics of a strategy: (a) a strategy is a *plan* one uses to accomplish a learning task (the selected strategy may be simple, complex, vague, intelligent, or unwise); (b) a strategy requires *knowledge* of specific skills or tactics (e.g., skimming, memorization techniques), and (c) *different learning tasks require different strategies*, and the learner must problem-solve in analyzing a task to devise an appropriate strategy.

Strategic Instructional Approaches

One goal of strategy instructions to teach learners to apply techniques, principles, or rules which enable them to solve problems and to complete tasks *successfully* and *independently* (Ellis, 1992). There are two broad-based approaches to strategy instruction. While terminology for these approaches have varied (e.g., direct and indirect instruction), we shall refer to these two approaches as *constructive* and *instructive*. As noted by Lenz (1992), the primary difference between the two approaches is the *role of the teacher*. In the constructive approach, the teacher guides the student to the knowledge and use of the strategy. This indirect approach focuses on prompting students to use strategies through modeling, questioning, shaping, and correcting. The teacher using indirect strategy instruction guides the student through the task, and as instruction progresses, gradually release the student to take responsibility for the effective and efficient completion of the task. In some instances of indirect strategy teaching, the teacher never presents the "best" strategy, but allows the student to discover the best approach to the task (Lenz, 1992). Reciprocal teaching (Palinscar & Brown, 1984) and cognitive apprenticeship (Collins, Brown, Newman, in press) are examples to indirect constructive strategy approaches. The cognitive apprenticeship and reciprocal teaching approaches are designed to bring tacit (i.e., knowledge of which we usually are not aware) processes into the open where students can observe, enact, and practice them with the help of the teacher or other students (Prawat, 1989). For example, in a cognitive apprenticeship approach, a teacher who is attempting to assist students in learning to solve subtraction word problems would first engage in instruction by "thinking aloud" those processes involved in solving problems of this nature. Such "thinking aloud" might involve elaborating on the inverse relationship between addition and subtraction, identifying clues in the word problem that suggest that subtraction is the operation to be performed, modeling the operation, and explicitly solving for the solution to the problem. As instruction progresses and students gain skill in these tacit processes, they are encouraged to "think aloud" with guidance from their teacher and/or other students. In other words, they "construct" meaning from the task at hand by integrating new knowledge with prior experience and becoming aware of the tacit processes involved in problem-solving, i.e., students develop their own personalized strategies with the guidance of their teacher or peers. Both reciprocal teaching and cognitive-apprenticeship models are *situated* learning models. That is, the strategies employed are embedded within "real-life" contexts and are used to solve realistic problems or concerns (Prawat, 1989).

When using direct, instructive strategy approaches, the teacher explicitly teaches a specific strategy (although the student is encouraged to adapt and personalize the strategy) (Lenz, 1992). The direct instructive strategy approach focuses on teacher identification of an effective and efficient strategy for rather specific tasks (e.g., notetaking) and training the student to use the strategy. Once an appropriate strategy has been determined, the teacher assists the student by: (a) ensuring that the student has mastered the essential prerequisite skills necessary for strategy use; (b) presenting the strategy to the student; (c) modeling and demonstrating the strategy for the student, and (d) providing the student with practice and feedback about the student's application of the strategy (Lenz, 1992). The *RAP*, a paraphrasing strategy, created by Schumaker, Denton, and Deshler (1984) is an example of a direct instructive strategy approach. Students are taught to use the following steps when they attempt to derive meaning from text:

R	=	Read a Paragraph
A	=	Ask yourself, "What were the main ideas and details in the paragraph?"
P	=	Put the main ideas and details into your own words

Examination of the procedural steps included in the *RAP* strategy, reveals that the student is taught a specific problem-solving strategy to facilitate reading comprehension. However, the student, upon completion of the strategy, personally *constructs* his or her own meaning from the text. Therefore, the major difference between the two strategic approaches is not the constructivism, but rather, is the explicitness inherent in the instructional processes. Whereas in constructive approaches, the teacher and student "think aloud" tacit processes, direct instructive approaches place emphasis on the direct teaching of specific strategies to solve learning problems. *Both* approaches allow students the opportunity to personalize and construct their own meanings. For optimal learning to occur, *both* approaches should be situated. That is, the illustrative instructive strategy above should be taught and practice within appropriate contextual situations (Ellis, 1992).

The direct instruction of strategies can be either general or specific in nature. For example, the RAP strategy is one in which the student can apply the strategy across content areas (e.g., reading, social studies, science). Consequently, if students are provided opportunities to practice using this strategy across contexts, the potential that the strategy will be transferred across settings is enhanced. As reviewed by Prawat (1989) some direct instructional strategies may be too specific, thereby decreasing the likelihood that students will generalize or transfer them to other potentially relevant contexts. That is, very specific strategies may become "welded" to specific contexts (Brown, 1982). For example, teaching a student a specific study strategy for passing next week's algebra test is unlikely to be generalized by the student in similar test-taking situations. As suggested by Prawat (1989), this phenomenon may occur for two dynamically interactive reasons. First, the amount of relevant knowledge at one's disposal is a critical factor in determining the extent to which one should rely on general versus more specific strategies. As Scardamalia and Bereiter (in Prawat, 1989) maintained, very general strategies may play a more important role when conceptual knowledge is meager. Second, Prawat highlighted the essential role of development plays in enabling learners to progress from a specific context to a relatively context-independent state where they are able to use cognitive resources flexibly across tasks and situations. In fact, Brown et al. (in Prawat, 1989) maintained that though knowledge is never content free, the range of applicability of any particular strategy is the hallmark of learner expertise or cognitive maturity.

Critical to the determination of whether an indirect constructive or direct instructive strategy approach should be employed is the issue of "teachability." Specific strategies are more teachable but can only be applied in a limited number of contexts whereas general strategies are more versatile but are also viewed as more difficult to teach (Prawat, 1989). Specific strategies are by definition very prescriptive (Prawat, 1989). Because such strategies involve the application of fairly simple routines to specific tasks, they are relatively each to teach. This "teachability" factor, however, can be diminished greatly, however, if instructional efforts are focused on assisting students to generalize specific strategies (for additional information, see limitations/barriers section).

Characteristics of Effective Strategy Instruction

Several research-based statements characterize the critical characteristics of effective strategy instruction, whether they are direct or indirect in nature. They are as follows.

* Effective strategy instruction includes the critical features of scaffolding (i.e., planning, monitoring, and evaluation (Pressley, Harris, & Marks, in press; Pearson & Raphael, 1990).
* Good strategy instruction promotes the active participation of students in their own learning (Winne & Marx, 1982; Peterson & Swing, 1982).
* Good strategy instruction has its long-term goal the ownership of strategies by students, i.e., students personalize and adapt strategies, know when, where, and how to use them, and are motivated to use them (Harris & Pressley, 1990).
* Good strategy instruction is characterized by strategies that are both *effective* (i.e., they enable the student to meet the demands of current and future tasks) and *efficient* (i.e., they enable the student to meet task demands in a timely, resourceful, and judicious manner) (Ellis, 1992; Lenz, 1992).
* The content of various strategies is organized strategically for maximal learning (Ellis, 1992).

Ellis (1992) identified three common problems faced by students across academic settings: (a) problems acquiring information (e.g., gaining information from textbooks); (b)problems storing information for future retrieval (e.g., organizing information in an efficient and effective manner that enhances long-term recall); and (c) problems with expressing or demonstrating competence in a specific content area (e.g., taking a test or making an oral presentation). Specific instructional strategies are designed to assist the student to use effective problem-solving strategies in each of these areas . Ellis (1992) provided an excellent review of specific strategies that have been developed to assist students in meeting these common problems. He also identified the critical features of effective strategies. These critical features, along with illustrative examples or clarifying comments, are provided below.

<u>A Strategy Must be Useful</u>

To teach strategies effectively, primary consideration should be given to the usefulness of the strategy. That is, they should enable students to successfully and independent meet important academic demands across a variety of tasks and learning settings. The usefulness of a strategy can be determined by the extent to which they meet the following criteria.

* *A strategy should assist the student in solving a key problem found in current settings faced by the student.*

  The selection of strategies should be individualized (e.g., one should provide strategic instruction for only students who need them, not all students), and should be based upon a specific a specific and important problem which is encountered frequently by the student in his or her current school environment (e.g., deriving meaning from text).

* *A strategy should enable the student to face similar demands across settings.*

  To promote transfer and generalization, the strategy should be inclusive enough to be applied across several content settings (e.g., a reading comprehension strategy is applicable across social studies, science, language arts settings).

* *A strategy should be applied frequently to meet setting demands.*

  Students should be required to apply the strategy frequently. Failure to provide students with frequent opportunities to employ the strategy may result in failure to remember the strategy. Re-teaching the strategy may become necessary. For example, a strategy designed to assist the student in notetaking during a lecture should be used by the student at least once or twice a week.

* *A strategy should be designed to be conducive to generalization across settings.*

  Although a strategy should not be too broad, it also should not be too specific. As Ellis noted, useful strategies are task-specific in a generic way. While they may be targeted for a particular type of task (e.g., taking a test), they should be broad enough to employ across settings (i.e., a test-taking strategy that can be used across content domains).

The Process of a Strategy Should Be Strategic

As addressed by Ellis, the "process" of a strategy includes specific procedures and explanations that enable the learner to *think* and *act* in order to meet a specific task demand. The process embedded in a specific strategy encompasses those activities that are required for successful task completion. Such processes can be either overt/physical (i.e., observable, such as noteaking) or covert/mental (i.e., unobservable cognitive or metacognitive behaviors). Criteria by which to judge this feature follow.

* *The strategy should contain steps that lead to a specific outcome.*

  An effective strategy is comprised of a specific set of steps that lead to a desired outcome (e.g., passing a test; understanding the main ideas from textual material).

* *The steps of a strategy should be sequenced in such a manner that it leads to successful task completion.*

Such a strategy has been broken down and analyzed in order to ensure that all essential steps in a problem-solving process have been included (e.g., all steps necessary to successfully write an expository composition). In essence, an effective strategy is a specific, well-sequenced plan of either overt or covert processes that when executed, lead to successful task completion.

* *The steps of the strategy should cue the student to use cognitive strategies, metacognitive processes, and appropriate skills and rules.*

Since the steps of a strategy can be used to facilitate self-instruction, the steps of the strategy should cue the student to engage in specific problem-solving behaviors. Ellis identified four types of behaviors that may be cued: (a) a cognitive strategy that may entail rehearsal, transformation, organization, or motivation features; (b) a metacognitive strategy (i.e., analyzing the problem and selecting, implementing and evaluating a specific cognitive strategy); (c) applying a specific skill, procedure, or rule (e.g., read a paragraph and put the main idea into own words); or (d) performing an overt action (e.g., devise a mnemonic technique for memorization of content material).

* *The steps of a strategy should cue the student to take some type of observable action.*

Some strategies may cue the student to engage in a specific observable activity that is necessary for successful task completion (e.g., "Remember to skip every other line when writing your essay").

* *The steps of a strategy should be completed in a short period of time.*

Strategies which take excessive amounts of time to complete are not very effective or efficient. Effective strategies enable the student to complete the required activity within a reasonable amount of time.

Effective Features of Strategy Models

Whether direct or indirect in design, most contemporary strategy teaching models incorporate a variety of features which promote student acquisition, utilization, and generalization of strategies. As identified by Pressley, Harris, and Marks (in press), these features are as follows:

- Introduction of only a few strategies at a time.
- Teaching and practice extended over a lengthy period of time and across diverse tasks. Substantial practice permits a great deal of student exploration by providing opportunities for discovering when and where particular strategies are successful.
- Strategic teaching occurs within the context of realistic academic tasks.
- Teachers extensively model strategies and provide verbal explanations and collaborative discussion of the thinking processes associated with strategy steps.
- Teachers explain and discuss with students the value of strategies and rationales for using them. They discuss with students *why* strategies aid performance and *when* they can be used profitably.

- Teachers provide extensive feedback and engage in substantial collaborative discussion with students as they learn and attempt strategies, and teachers provide re-explanations and re-teaching when necessary.

- Teachers and students determine opportunities for transfer (i.e., they identify specific situations within the student's academic environment in which the strategy can be used).

- Throughout instruction, teachers attempt to keep motivation high, largely by highlighting the empowerment that accompanies acquisition of powerful procedures that accomplish important academic tasks.

- Teachers encourage habitual reflecting and planning. Teachers model reflection and provide opportunities for students to think through the solutions to their academic problems.

Definitions and Examples of Terms

Self-Instructional Training

Involves teaching the students specific verbalizations in a step-by-step sequence. The verbalizations address specific problems of the child (e.g., attending) and are modeled by the teacher and rehearsed by the child (Finch & Spirito, 1980). Verbalizations modeled by the teacher and rehearsed by the child usually are of four types: (a) problem definition, (b) focusing of attention, (c) coping statements, and (d) self-reinforcement (Finch & Spirito, 1980). The modeling and rehearsal following a sequence such as that offered by Meichenbaum and Goodman (in Finch & Spirito, 1970):

1. Teacher models the tasks, talking aloud as the child observes.
2. Child performs the task, instructing himself aloud with the assistance of the teacher.
3. The child performs the task aloud with no assistance from the teacher.
4. The child performs the task as she or he whispers.
5. The child performs the task silently (covertly).

Executive Functioning

Refers to the ability to create and apply a strategy to a novel problem (Ellis, Deshler, & Schumaker, 1989).

Cognitive-Behavioral Modification

Involves the manipulation of covert thought processes to modify overt behavior that includes a combination of behavior modification techniques, self-monitoring, self-instruction, and self-evaluation (Hallahan & Sapona and Hresko & Reid, in Sheinker, Sheinker, & Stevens, 1984).

Metacognition/ Executive Functioning

Involves knowing about and controlling one's own thinking and learning (Sheinker, Sheinker, & Stevens, 1984).

Mnemonics	Transformation of to-be-learned materials into a form that makes them easier to learn and remember (Levin, 1981).
Cognitive Restructuring	Refers to a variety of techniques used to change an individual's self-statements as well as the premises of assumptions and beliefs underlying them (Meichenbaum, in Marzano & Arredondo, 1986).
Learning Strategies	Techniques, principles, or rules that will facilitate the acquisition, manipulation, integration, storage, and retrieval of information across situations and settings (Schumaker, Deshler, Alley, Warner, & Denton, 1982).
Strategic Knowledge	Understanding of how one functions as a learner and awareness of how one's ability matches the task (Alexander, Schallert, & Hare, 1991).
Thinking Frame	A representation intended to guide the process of thought, supporting, organizing, and catalyzing that process. This representation may be verbal, imagistic, even kinesthetic. A thinking frame includes information not only about how to proceed by when to proceed in that way (Perkins, 1986).
Cognition	Refers to all aspects of mental function (Resnick, in Jones, 1986).
Cognitive Instruction	Refers to any effort on the part of the teacher or the instructional materials to help students process information in meaningful ways and become independent learners.

Limitations/Barriers to Effective Use

1. *Difficulty Explicating Tacit Processes*
Polyani (in Wong, 1992) pointed out that much of knowledge is *tacit* (i.e., that it cannot be explicated in words under normal conditions. Because tacit knowledge represents that knowledge which has become automatic (e.g., tying a shoe or driving a car, etc.), explicating the processes involved may be difficult.

2. *Adequate Prerequisite Skills/Knowledge of the Learner*

Students need to have acquired some basic prerequisite skills before strategy instruction can be implemented successfully. For example, in the RAP strategy, students must have achieved enough reading proficiency before this strategy can be optimally effective. In their review of research, Sheinker, Sheinker, and Stevens (1984) cited several studies which suggested that strategy generalization may be difficult for those children whose achievement is below the mid-third to fourth grade level. Additionally, Deshler, Schumaker, Lenz, and Ellis (1984) suggested that strategy instruction may not be appropriate for students with severe disabilities.

Both Wong (1985) and Miyake and Norman (1978) noted the prior knowledge and skills that students bring to a task is a critical consideration prior to the implementation of strategy instruction. To illustrate, in Miyake and Norman's (1978) study, two groups of novice students in a computer class were given different instructional manuals. One group receive a difficult and advanced manual, and the other group received an introductory manual designed for novices. Results of this study indicated that students who received the introductory manual were able to generate more questions than did those students who received the more difficult manual. The authors of this study concluded that the individuals who received the difficult manuals lack the substantive basis with which to begin formulating questions. Both prior knowledge and the strategies selected appear to dynamically interact as evidenced by Chi's (1985) dinosaur study. In this study, children with expert knowledge of dinosaurs categorized pictures of dinosaurs by more abstract features (e.g., meat eaters versus plant eaters) than those with limited knowledge of dinosaurs. Novices, in this study, categorized dinosaurs by their physical or perceptual features (e.g., by visible similarity). The results of this study highlights what Wong (1985) maintained is the interactive nature of prior content knowledge and strategy use.

Sheinker, Sheinker, and Stevens (1984) extended this limitation by warning educators of the danger of perceiving strategy instruction as a substitute for content instruction. Additionally, the recommended that strategy instruction be a distinct, well-organized part of the on-going curriculum, embedded in real-life learning contexts.

3. *Teacher Assumes the Initial Responsibility for Strategy Instruction*

Whether strategy instruction is direct or indirect, teachers must assume the initially responsibility for instruction. Several researchers (e.g., Deshler et al., 1984; Ellis, Deshler, & Schumaker, 1989) have noted that while this is essential during the initial stages of instruction, it is not conducive to learner independence in the long-term. As addressed by Harris and Pressley (1990), it becomes critical that students begin to generate and personalize their own strategies, independent of teacher assistance. Consequently, students must be taught executive strategies that help them to analyze a novel problem and then design their own strategy or adapt a previously learned strategy. Ellis, Deshler, and Schumaker (1989) demonstrated that students can be taught to generate or adapt executive strategies to successfully solve novel problems.

Ellis, Lenz, and Sabornie (1987) proposed four levels of generalization training that should occur during strategy training, each of which can be mediated by the teacher, the student, or peers:

* *Antecedent generalization training* - activities that promote generalization prior to the teaching of a new strategy (e.g., addressing strategy design and students' motivation to learn and use the strategy).

* *Concurrent generalization training* - emphasis should be on the acquisition of the strategy to the extent that it becomes a generalized procedure.

* *Subsequent generalization training* - activities addressed after the student has mastered the strategy but is not habitually using and adapting it to other settings.

* *Independent generalization training* - activities facilitated by the teacher that promote self-regulatory skills of the pupil to attain generalization and adaptation of the new strategy.

4. *Limited Applicability to Lower-Order Thinking Tasks*

Deshler et al. (1984) and Schuler and Perez (1987) noted that a cognitive strategy approach may be more appropriate for higher-order tasks (e.g., reading comprehension) rather than lower-order tasks (e.g., word decoding). Sheinker, Sheinker, and Stevens (1984), in their research review, suggested that more traditional techniques, such as direct instruction and mastery learning, may be more effective in teaching literal skills whereas strategy training may be more effective in the teaching of inferential skills.

5. *Limitations in Our Understanding of the Developmental Nature of Generalization and Maintenance*

Harris and Pressley (1990) suggested that one of the striking shortcomings of the instructional literature on generalization and maintenance has been the failure to attend to developmental constraints on instructional benefits. As they pointed out, we know very little about the breadth, depth, and course of the developmental and generalization capabilities of children, and thus, have little but intuition to guide us in setting reasonable criteria and evaluation outcomes in our research. In their research review, Harris and Pressley (1990) noted that it has become increasingly apparent that less explicit instruction is needed to promote durable strategy application with older children than is the case with younger, normally achieving students. Metacognition as relevant to strategy use, then, appears to develop with age and experience.

7. *Strategy Instruction Requires Teacher Education*

Several authors have addressed the extensive training that is required to successfully implement strategy instruction (Ellis, 1990; Hermann, 1990; Pressley, Harris, & Marks, in press). Consequently, education at both the pre-service and in-service levels may be needed to ensure that effective implementation of strategy instruction occurs.

Making Instruction Explicit

Principle 9: ***Students can become independent, self-regulated learners through instruction that is explicit.***

Overview

The extent to which instruction is made explicit directly impacts both student achievement and independent, self-regulated learning. Generally, much research (cf. Rosenshine & Berliner, 1978) within the apst twenty years has been focused on the efficacy of both didactic (i.e., formal, controlled instruction) and heuristic (formal, inquiry, discovery-oriented teaching) instructional models. Perhaps the primary differentiation between these two models is the degree to which teachers provide explicit instruction. In didactic models, teachers make explicit instructional goals, objectives, content, and expectations to students. Explicitness in instruction runs counter to heuristic models as students, through exploration, develop their own interests, goals, and objectives. Didactic models such as direct instruction, mastery learning, and precision teaching have been found to be superior to heuristic models, such as discovery learning, in promoting student achievement (cf. Berliner, 1978; cf. Kindsvatter, Wilen, & Ishler, 1988).

Research on explicit teaching has been undertaken within both the process-product and cognitive-learning paradigms. The results of this research, as we shall see, highlights what appear to be complimentary research findings.

Explicit Teaching and Cognitive Learning Research

As Rosenshsine (1986) noted in his extensive review, research in three areas of cognitive processing research directly supports the need for explicit teaching. These three areas include (a) research which suports the limitations of working memory; (b) research which highlights the importance of practice, and (c) the importance of continuous practice until students are fluent. Current research suggests that there are limits to the amount of information that students can attend to, and process, effectively. That is, research (cf. Rosenshine, 1986) that individuals can process only about seven points at any given time in their working memory. Consequently, when too much information is presented at any given time or when processing demands become too great, students' working memory may become overloaded. Therefore, they may become confused, omit essential information, skim material, or otherwise not process information effectively. One implication from this research is when teachers present new or difficult material, they should do so in small steps, arranging for practice after each step. This way, students can process and manage new or difficult information more effectively. Teachers can also assist students processing information by providing outlines that highlight major points or concepts or that present main ideas of the material to be learned.

As reviewed by Rosenshine (1986), students have to process new material effectively in order to transfer it from working memory to long-term memory. That is, they have to elaborate, review, rehearse, summarize, or enhance the material in some way to increase the likelihood that information will be transferred to long-term memory. Students can do this through *active practice* which is facilitated if the teacher asks students questions, requires them to summarize main points or themes, has students tutor one another, and supervises students as they practice new steps in a skill. Extensive practice and frequent review are needed after the material is first learned so that it can be recalled effortlessly and automatically in future work. When prior learning is autormatic and fluent, this frees space in our working memory which can be used for application and higher-level thinking.

Process-Product Research

Cooper (1982) defined and effective teacher as "... one who-is able to bring about intended outcomes" (p. 59). Several research-based statements suport the contention that is the explicit manner in which effective teachers conduct their lessons that result in the realization of their intended outcomes. These statements follow.

1. <u>Making Goals, Objectives, and Expectations Explicit</u>

First, and perhaps most importantly, effective teachers make explicit to students their goals, objectives, and expectations. Effective teachers, according to Leinhardt (1986), implement their lessons in academic environments which focus on the *specifics* that students are expected to learn. In their review of research, Kindsvatter, Wilen, & Ishler (1988) concluded that instructional objectives facilitate learning when they are communicated to students by teachers who make explicit *what* is to be accomplished and *how* it is to be accomplished. Such explicitness appears to provide learners with a structured environment in which they can predict and comprehend adequately (Anderson, Stevens, Prawat, & Nickerson, 1988).

2. <u>Making Instructional Content Explicit</u>

Leinhardt (1986) in reviewing research on effective teaching, concluded that expert teachers are especially good at constructing lessons that successfully communicate the content that needs to be learned. In doing so, they provide lessons that are *clear*, *accurate*, and *rich* in example and demonstration of a particular task.

According to Rosenshine (1986), the research conducted since 1974 has yielded a consistent pattern of instruction that supports instruction of well-defined skills. By carefully defining skills to be mastered, effective teachers are able to present information in small steps and then pausing long enough to ensure that students have mastered each step (e.g., through guided practice, eliciting active and successful participation from all students. In general, Rosenshine (1986) reported that when effective teachers teach concepts and skills explicity, they routinely engage in the following activities.

* They begin each lesson with a *concise statement of goals*.
* They begin each lesson with a short *review* of previous and/or prerequisite skills.
* They present new information in *small steps* with student *practice* following each step.
* They give *clear and detailed instructions* and explanations.
* They provide *active practice* for all students.
* They ask many questions, *checking for student understanding* and obtain responses from all students.
* They *guide* students throughout intial practice.
* The provide *systematic feedback and corrections* in a timely manner.
* They provide explicit instruction and practice for seatwork exercises and when necessary, monitor students throughout seatwork activities.
* They continue to provide practice until students are *fluent and confident*.

Rosenshine (1986) identified six teaching functions that serve to make the instructional process more explicit for students. These teaching functions were also supported in an extent review written by Clark (1992).

* First, teachers can make instruction more explicit by engaging in ***daily reviews*** which may include reviewing homework, relevant previous learning, or prerequisite skills. The focus of such reviews serves to activate students' prior knowledge of relevant concepts that facilitate linkage between students' prior knowledge and the new material to be learned.

* When ***presenting new material,*** teachers should make explicit their goals and objectives for students. Rosenshine offered the following useful suggestions:

  - provide outlines of lessons which address the major concepts or ideas to be learned.
  - teach in small steps, particularly when material is new and check for understanding after each step is completed.
  - focus on one thought or concept at a time.
  - model procedures explicitly for students.
  - provide concrete, positive examples and non-examples
  - check for student understanding
  - use clear language.
  - give clear, step-by-step directions.

* After the presentation (or afer short segments of the presentation) the teacher should engage students in ***guided practice.*** That is, teachers should actively supervise and interact with students during initial and, if needed, subsequent practice sessions, providing elaboration and enhancements as needed. Questions during effective guided practice should include: (a) those designed to determine if students know specific answers, and (b) those that require students to explain how their answers were determined. Success rate during guided practice should be relatively high, though challenging enough to optimize learning (Rosenshine recommended success rates somewhere betwen 75-80% during initial practice sessions).

* During and after students practice skills, teachers should provide ***explicit feedback and correctives*** to students. Teaches should make sure that they tell students when their answers. Additionally, teachers frequently should provide process or procedural feedback to students. Errors should not go uncorrected. Finally, instruction is more effective when teachers teach to mastery before moving on to new material.

* Follwing intitial and guided opportunities for independent practice, teachers should provide opportunities for students to engage in ***independent practice.*** This type of practice enables students to become fluent and prmotes automaticity (i.e., the level at which they are able to complete skills successfully and rapidly without having to think through each step).

* To assist students to remember the information learned, teachers should engage in ***weekly and montly reviews***, whenever possible. Such reviews increase the likelihood that information will be retained over time.

3. Making the Structure of the Lesson Presentation Explicit

Leinhardt's (1986) extant review indicated that effective teaches develop *specific instructional routines*, and the boundaries between the different segments of a lesson are well-defined. For example, effective teachers structure homework, drill, review, presentations, student practice, etc. into clearly defined segments of their lesson. As as result, students in the class are provided with consistency and structure, and seldom are lost.

Definitions and Examples of Terms

Discovery Learning

An instructional approach usually accredited to Jerome Bruner (in Dembo, 1977). This instruction stresses the importance of allowing learners to understand the underlying principles that give structure to a domain or subject. Instruction is presented in such a manner that children are not "told" concepts, but are allowed to discover and attach their own personal meanings and understandings to concepts. An assumption of this approach is that rote memorization will be recall except for during the short-term. This emphasis of this instructional approach is to provide children with with real-life problem situations and allow them to find their own personally satisfying meaing. Central to the discovery learning approach is the spiral curriculum (i.e., a curriculum in which topics are developed and re-developed in increasing complexity over the school years). Steps in discovery learning identified by Toba (in Dembo, 1977) are:

(a) present the student with some baffliing problem which begins the process of inquiry;
(b) by withholding important generalizations, the student is challenged by the teacher and is encouraged to explore the problem individually;
(c) the student then grasps the organizing principle of the problem and relates this to prior knowledge;
(d) the student demonstrates understanding of the generalization; and
(e) the student then is able to verbalize the principles underlying the problem.

Example: When presenting primary and secondary color relationships, students are allow to experiement combining various colors until they are able to determine the underlying principles (i.e., primary and secondary color status).

Limitations/Barriers to Effective Use

1. *Need for Teacher Education in Explicit Teaching Techniques*

   Explicit teaching necessitates that teachers have honed their skills in numerous areas including objectives writing, providing appropriate lecture structure, modeling, guided practice, etc. These skills may need to be taught at both the in-service and pre-service levels.

2. *Teacher Resistance to Change*

   As Hermann (1990) noted, teachers may be resistance to change for a number of reasons. First, they have been educated themselves in schools settings which are traditional. Additionally, teachers may be unaware of the complexity involved in the reflective and reasoning processes involved in making teaching explicit and may be resistant to making the efforts needed for change.

Teaching Sameness

Principle 10: ***By teaching sameness both within and across subjects, teachers promote the ability of students to access potentially relevant knowledge in novel problem-solving situations.***

Overview

Consider the results of the following study conducted by Anderson and Smith (1984).

> Middle school students were asked to read a text that incorporated an analogy of a bouncing ball to illustrate the general concept of reflected light (i.e., light bounces off things much like a rubber ball). Later, students were provided, along with accompanying pictures, with a novel problem that required them to access the information obtained from this analogy. For example, students were presented with a picture and asked the question, "When sunlight strikes a tree, it helps the boy to see the tree. How does it do this?" Despite the analogy provided in the textual reading, 80% of the students failed to use the concept of reflected light to assist them in solving this problem.

In this study, the researchers concluded that the textual analogy had failed to alter students' misconceptions. By extension, one could also argue that the students' failed to identify the *commonalties* between the rubber ball and reflect light problems. The results of this study illustrate the importance of teaching students *commonalties across various topics and types of problem-solving situations.* Several researchers, such as Kameenui (1991), Pea (1987), and Prawat (1989), believe that educators should devote more attention to defining common elements both within and across subjects.

Reid (1991) expressed concern regarding the extent to which our nation's schools fail to instruct students to solve problems flexibly. He stressed that traditional instruction provides students instruction in skills in an isolated fashion, with little effort to teach students to use the various skills they learn in a versatile manner. He stated.

> ...teaching in American education has come to mean presenting decontextualized, simplified components of a task until each component has been mastered. The implicit assumption that students will be able to use those components in a flexible, coordinated manner, however, has not held. (p. 299)

Ways in which educators can assist learners to use the skills and knowledge they acquire in a flexible, coordinated manner are (a) by analyzing the curricula to determine commonalties (i.e., conducting "sameness analyses") and (b) by explicitly instructing students regarding these commonalties. By engaging in these two activities, teachers are promoting cognitive organization and flexible cognition. Consequently, when students are able to detect commonalities across various problem situations, they are able to access potentially relevant knowledge more readily and flexibly.

What is Teaching Sameness?

According to Campbell (in Kameenui, 1991), a single concept can link many seemingly different ideas. Therefore, this single linking concept has great generality and power to assist students in seeing "... *the general in the particular*" (Mason, in Prawat, 1989). In other words, by providing students with numerous examples of structural sameness, students may begin to generalize through presentations or examples "of the particular" (Kameenui, 1991).

By determining the commonalities within and across subjects, Englemann and Carnine (in Kameenui, 1991) proposed that educators could link different subjects (e.g., spelling, history, reading comprehension, etc.) by identifying structural samenesses. As Kameenui (1991) proposed, the hidden grammar that links a wide range of complex concepts from vastly different topics is implicit in the "teaching of sameness." To illustrate, in Figure 9, Kameenui (1991) provided several illustrative examples of the structural sameness within various subjects. In this figure, Kameenui proposed that both the invention of cotton gin and the Mormon practice of polygamy (though seemingly different in terms of surface features) actually have an element of structural sameness (i.e., they incorporate features involving problem-solution-effects analyses). Through the identification of structural sameness within and across subjects, teachers can (a) eliminate students uncertainty about a new and relatively unknown topic, (b) assist students in making associative links in their cognitive structures, and (c) teach more in less time (Kameenui, 1991).

Rationales for Teaching Sameness Across Subject Matter and Curricula

A. <u>Developmental Considerations in Teaching Sameness</u>

According to Chi (1985), one very robust developmental finding regarding the organizational capabilities of young children is that their inability to recall is related to *inefficient strategy organization.* Chi noted that there appears to be among young children an absence of the taxonomic categorical clustering strategies that characterize the adult population. Whereas as adults often categorize according to superordinate and subordinate variables, young children's categories tend to organized on the basis of such features as perceptual similarity and concrete association. Additionally, results of a series of studies conducted by Chi (1985) revealed the additional findings: a) young children's categorical knowledge sets are *fewer in number* with a more restricted set of core or central members, and b) young children are capable of sorting and categorizing items into their taxonomic categories *when explicitly requested to do so.* Needless to say, the immature manner in which children go about the task of categorizing results in inefficient organization, and ultimately, limited ability to access relevant information in potentially relevant situations.

Loper (1980) concluded that young children appear to be less able to differentiate the essential from non-essential aspects of a task. Taken together with Chi's (1985) findings, it seems that teachers can do much in facilitating the manner in which children organize their knowledge. By assisting children in seeing both the *similarities* and *differences* across various topics and content material, teachers are increasing the likelihood that students, especially younger ones, are organizing there knowledge in a more efficient and effective manner.

B. <u>Teaching Sameness Helps Students to Recognize Patterns and Organize Knowledge</u>

"Teaching sameness" across subject matter and curricula assists students to recognize patterns both within and across content areas. Studies involving both children (Chi, 1978) and adults (de Groot, 1965,) have suggested that experts learners appear to be superior to novices or ineffective learners in their ability to recognize basic "*problem types or patterns.*" This superior knowledge also appears to play an important role in guiding the strategies experts employ during problem solving.

Chi (1978) and de Groot (1965) have suggested that experts *organize* their knowledge differently from novices or ineffective learners. Whereas novices group problems or patterns in terms of *specific, concrete features*, experts appear to group information according to more *abstract principles*. For example, in a study of children's grouping of dinosaurs, Chi (1978) reported that those children with "dinosaur expertise" grouped dinosaurs according to much more abstract principles (e.g., meat-eaters versus plant-eaters) than did novice learners. Novices in this study grouped the dinosaurs in a more concrete fashion (i.e., by perceptual similarities).

The superior manner in which experts organize their knowledge of problem types or patterns appears to be, at times, even more important than the *extent* of one's knowledge base (Polya, in Prawat, 1989). As addressed in the two preceding effective teaching principles, key ideas or understandings are represented within the cognitive system as *associative links* or *relations*. Accessibility of knowledge, then, is a function of the strength of these associative links or relations. Seeing the interrelationships among units of knowledge, according to Prawat (1989), is the *sine qua non* of conceptual understanding. Consequently, by teaching sameness both within and across subject matter, teachers provide students with the means to make stronger associative links in their cognitive structures. As Prawat (1989) noted, effective teachers present information in such a way that students are able to make the associative connections and integrate it with, and differentiate it from, what they already know. Fostering this kind of connectedness contributes to the flexible accessing of relevant knowledge in diverse problem-solving situations.

Teaching sameness helps students to organize knowledge by fostering *relational understanding*. That is, understanding the interrelationships among various problem situations, enables students to remember them as parts of a whole (Prawat, 1989). Though more difficult to learn, relational understanding is very potent in terms of long-term memory storage and flexible accessing (Prawat, 1989).

In his review, Prawat (1989) maintained that various domains (e.g., mathematics, reading, social studies) are comprised of a group of *"key ideas"* that form the basic building blocks for understanding. For example, Resnick and Omanson (in Prawat, 1989) have identified several key ideas that form the underlying principles of subtraction (e.g., principles of additive composition and partition), As an interesting extension to this argument for incorporating key ideas into instruction, Leinhardt (1988) reported that several "key ideas" were constantly repeated throughout a series of subtraction lessons presented by an expert teacher. The findings from this study tentatively suggest that the provision of key ideas to students may enhance student learning.

Teaching Techniques to Incorporate Sameness

As Kameenui (1991) asserted, very little progress has been made in recognizing the structural sameness embedded within curricula . In his seminal article, Kameenui identified two important reasons why creating "sameness" within the curriculum is important. First, by conducting a "sameness analysis" of the curriculum, teachers can teach more content in less time. Second, the structural sameness allows students to acquire the building blocks essential to the development of complex cognitive structuring.

Teachers can facilitate the teaching of sameness by utilizing metaphors and analogies to communicate key ideas, thereby fostering students' awareness of the connectedness or interrelationships among problems (Prawat, 1989). Both analogies and metaphors have been researched extensively and proved to be effective techniques for assisting students to transfer information from a known domain to a new one (cf. Prawat, 1989). Research has suggested that analogies and metaphors are effective techniques to facilitate the development of new schemata and to promote recall. These techniques appear to be particularly effective when (a) they are explicitly used as cues to prompt recall, and (b) two or more analogies/metaphors are used to illustrate a specific concept, and (c) when students are provided with multiple opportunities to use analogies and metaphors to solve problems (Glick & Holyoak, 1983; cf. Glover, Ronning, and Brunning, 1990).

As Glover, Ronning and Brunning (1990) concluded in their review, many students (including college students) do not *spontaneously generate* analogies and metaphors in problem-solving situations. Therefore, students may need to be prompted to use the analogy/metaphor to help solve a relatively similar, yet still novel, problem. Also, the use of multiple analogies and metaphors to illustrate structural sameness appears to help students to utilize relevant knowledge in future problem-solving situations. Of utmost importance is that students be provided with ample opportunities to solve structurally similar problems so that transfer is enhanced. Teachers can facilitate transfer of knowledge necessary for problem solving by pointing out features of the problem situation that if present in future situations, would suggest further utilization of the same information (Prawat, 1989). Finally, Gick and Holyoak (1983) were able to promote transfer by having individuals produce written comparisons or visual representations that highlight common and important features across analogous situations.

Definitions and Examples of Terms

Sameness Analysis	Sameness analysis involves the determination of structurally similar concepts across curricula topics. Concepts which link many diverse ideas are identified throughout the curriculum. The curriculum, and its presentation, are organized to facilitate the teaching of concepts which are structurally similar (Kameenui, 1991).

Limitations/Barriers to Effective Use

1. Conducting Sameness Analyses is a Difficult and Time-Consuming Task

The task of identifying sameness across curricula is at best a time-consuming, laborious process. Such an undertaking would require that educators and curriculum developers alike spend considerable time determining structural sameness across topics and designing and developing the curriculum in a manner that would facilitate the teaching of sameness in coherent, meaningful ways to students. To complete such a task, not only would educators and curriculum developers have an in-depth understanding of the curricula in their respective domain(s) of expertise (e.g., social studies, social, mathematics), but also be able to identify sameness in domains outside their realm of expertise. As Kameenui (1991) noted, the identification of structural sameness includes the identification of structural differences and misconceptions as well. With these limitations and barriers in mind, educators and curriculum developers must have both ample training and time to undertake the comprehensive analysis that would be required to conduct a sameness analysis.

2. Little Research Has Been Conducted to Determining the Efficacy of Teaching Sameness Within and Across Curricula

Although techniques such as the use of analogies and metaphors have been studied extensively, the efficacy and practical utility of conducting a sameness analysis and using the results from this analysis have not been studied.

Figure 9. Summary of Sameness Analysis

Topic	Greatly Different Examples	Surface Features	Structural Sameness
Earth Science	a. *Pot of boiling water:* When heated molecules of water flow in a roughly circular pattern b. *Earthquake:* Molten sections between earth's crust and core move in constant circulation	*Small scale example* - stove element, water *Large-scale example*- earth's core, molton rock	**Convection Cell** The circular movement of heat away from a hot object and flow of cooler mater toward the object.
Social Studies	a. *Invention of Cotton Gin:* It was difficult to remove seeds from short staple cotton. The cotton gin removed the seeds efficiently and created a greater market for cotton. b. *Mormon Practice of Polygamy* Because of their practice of polygamy, the Mormons moved west to Salt Lake and developed a successful farm community.	*Economic Context* - cotton, demands of market *Human Rights Content* - Mormons, Salt Lake, development of a community	**Problem-Solution-Effects Analysis** The sameness is not in the events, but in the nature and sequence of events that involve identifying a social, political, economical problem, its solution, and the effects of the solution.
Mathematics word problem solving	a. *Subtraction Word Problem:* Mark can get some money from his mother to help pay for a school trip. He has earned 57 dollars. How much more money will his mher give him? b. *Multiplication Word Problem:* If each shirt requires 2 yards of material, how much material will be needed to make 5 shirts?	*Subtraction*- linguistic features, numerical features syntactic structure *Multiplication* - different linguistic features, numerical features, syntactic structure	**Number-Family Analysis** The sameness is in mapping what is known and not known in a problem by determining if the "big" number and a "small" number are given, or if just the small numbers are given.

Source: Kameenui, E. (1991, Fall). Toward a scientific pedagogy of learning disaiblities: A sameness in the message. *Direct Instruction News*,17- 22

Effective Lesson Structure and Critical Presentation Techniques

Overview

Hawes and Hawes (in Kindsvatter, Wilen, & Ishler, 1988) defined instruction as "... a process by which knowledge and skills are developed in learners by teachers" (p. 94). Throughout this instructional process, teachers engage in a variety of behaviors, techniques, methods and strategies to develop students' knowledge and skills. Teacher *behaviors* include such techniques as informing, motivating, supporting, questioning, managing, and listening. Also included in this instructional process are *lesson presentation techniques*, such as entry and closure, that also directly impact student learning (Kindsvatter, Whilen, & Ishler, 1988).

Most of the research in these two areas has been derived from the process-product research (Kindsvatter, Whilen, & Ishler, 1988). This research has focused on determining the impact of *specific teacher behaviors* and *instructional techniques* (process variables) which promote student learning outcomes (product variables). The bulk of this research has suggested that there are numerous teacher behaviors and instructional techniques that positively enhance student learning. Variables such as (a) the manner in which teachers gain students' attention, (b) lesson entry and closure, (c) teacher questioning, (d) teacher feedback, (e) providing praise and criticism, and (f) monitoring of activities have been identified as having a direct impact on student learning (Anderson, Evertson, & Brophy, 1979).

In light of the research findings in these areas, the purpose of this section of the paper is to explicate these findings and to provide illustrative examples of lesson presentation techniques and teacher behaviors that have proved to positively impact student learning. This section is divided into two parts. The first section, entitled *Effective Lesson Structures* is designed to address the phases of an effective lesson as well as to review such variables as modeling, verbal rehearsal, gaining attention of learners, goal-setting, practice, and the use of instructional organizers. The second section, entitled *Critical Presentation Techniques,* addresses teacher behaviors such as teacher questioning, student responding, pacing, and student turn-taking.

Effective Lesson Structures

Englert (1984), in her review of the effective teaching research, identified three major phases of lessons. Delineated in Figure 11, these three phases summarize those teacher behaviors which are critical to each phase. Generally, these three phases may be labeled as *Reviewing Previous Learning and Communicating Lesson Goals and Expectations* (Phase 1), *Active Demonstration and Practice* (Phase 2), and *Independent Practice and Systematic Feedback* (Phase 3).

Rosenshine (1986) in his review of the effective teaching research, identifed several features of an effective lesson structure. *Effective teachers*:

* begin each lesson with a statement of goals.
* begin each lesson with a review of previous, prerequisite learning.
* present new material in small steps with student practice following each step.
* provide active and sufficient practice for all students.
* ask many questions, frequently check for student understanding, and obtain responses from all students.
* provide systematic feedback and corrections to students.
* provide explicit instruction and practice for seatwork activities, and when necessary, actively monitor students during these activities.
* continue to provide practice until students are independent and confident.

In his synthesis of the effective teaching research on effective lesson structures, Rosenshine (1986) divided the results into six critical teaching functions. Summarized briefly below, these functions form the basis for an effective lesson structure. More detailed enabling techniques to assist the teacher in structuring lessons (e.g., techniques for gaining the attention of learners, communicating lesson goals to learners etc.) are provided following this section.

Teaching Function #1: <u>Review</u>

Effective teachers begin their lessons with a 5- to 8-minute review of previously learned material, correction of homework, and/or review of relevant prior knowledge.

Teaching Function #2. <u>Presentation of New Material</u>

Effective teachers spend more time presenting new materials and providing guided practice than do less effective teachers. Effective teachers spend this additional presentation time giving additional explanations and illustrative examples, checking for student understanding, and providing *intensive* and *extensive* instruction so that students are able to become independent in the concept, procedure, or skill that is being taught.

The effective teacher begins presenting new material to learners by first gaining learners' attention. Effective teachers present one point or idea at a time using ample examples and non-examples. This elaboration allows students to process information more efficiently.

During the presentation, effective teachers stop frequently to check students' understanding by posing questions (e.g., asking them to summarize the presentation, repeat directions or procedures). As a result of this checking, effective teachers make decisions regarding whether or not to proceed with presenting new information *or* to re-teach the material.

Rosenshine provided six suggestions for teachers to follow when presenting new material: (a) state lesson goals; (b) focus on one point (thought, idea), completing one point before proceeding; (c) teach in small steps, checking frequently for understanding; (d) model the behaviors explicitly for students; (e) organize the material so that one point is mastered before the next point is presented; and (f) avoid digressions.

Teaching Function #3. <u>Guided Practice</u>

After presentation (or short segments of the presentation), the effective teacher engages students in guided practice. That is, the teacher actively supervises students' initial practice attempts and provides enhancement and elaboration as needed. This guided practice paves the avenue by which the new knowledge is transferred from working memory into long-term memory. Analogous to scaffolded instruction, the ultimate purpose of the guided practice phase is to help students to become independent in the skill, concept, or procedure being taught.

During guided practice, students participate by *applying* the rule, procedure, concept, or skill and by *answering* teacher questions. Questions asked by the teacher are of two types (a) those calling for specific answers, and (b) those that call for an explanation of how an answer was determined (i.e., process questions). Effective teachers enhance this process by asking questions of individual students (e.g., asking them to repeat directions, procedures, main ideas, or answer factual questions).

Of primary importance is that guided practice should be sufficient to the extent that students have mastered the skills, albeit hesitantly. *The effective teacher does not proceed until students have mastered the presented material.*

Rosenshine cited two factors which teachers need to consider when providing guided practice. These are the percentage of correct answers given by students and students' active participation in the practice. Effective teachers endeavor to ensure high rates of student success to their frequent questions. Good and Grows (in Rosenshine, 1986) found that 82% of students' answers were correct in classes conducted by effective teachers. In contrast, less successful teachers generated successful answers to their questions only 73% of the time. Rosenshine suggested an optimal success rate between 75% to 80% during the guided practice phase of instruction.

Teaching Function #4. <u>Feedback and Corrections</u>

Effective teachers use praise and feedback judiciously. Effective teaching research has suggested that there are differential ways in which feedback and praise should be given. First, if a student is correct and confident, a teacher should provide a short statement of praise while maintaining the momentum of the lesson. Second, if a student correctly responds, but is hesitant, the teacher should tell the student that the response is correct, and in some cases, should rephrase the student's response. Such reteaching may give unsure students the additional explanation that is sometimes needed to help them to feel certain and confident. Finally, if a student responds incorrectly, it is appropriate for the teacher to simplify the question, provide hints, or reteach the material. In this instance, it is important for the teacher to let the student know that the answer is incorrect. Teachers should not *simply give* the correct answer and then move on. When responses are incorrect, *additional explanation*, *reteaching*, and *elaboration* are needed.

Kulik and Kulik (in Rosenshine, 1986) found that instruction was more effective when students (a) received immediate feedback after a quiz, and (b) were allowed opportunities for further study and to retake the quiz. This allowed students to reach criterion mastery levels. Consequently, teachers may choose to restructure their lesson presentations and grading systems to incorporate features of immediate feedback and opportunities to retake examinations. This alteration would enable students to reach criterion mastery levels, thereby ensuring that they are ready for the next step of skills, concepts, or material to be introduced in the instructional sequence.

Teaching Function #5. <u>Independent Practice</u>

At the conclusion of guided practice, students are expected to complete the steps, procedures, etc., correctly but they may not have gained the needed fluency that will enable them to work independently. The development of fluency and automaticity are the major purposes of independent practice. After substantial independent practice, students will achieve an automatic stage in which they are successful, rapid, and no longer have to devote much time to "thinking through" the procedure or skill.

Rosenshine noted that effective teaching research has suggested that when students are provided with independent practice at their seats, teacher contacts with students should be brief (i.e., 30 seconds or less). Lengthy explanations during independent seatwork activity indicates that initial teaching and guide practice were insufficient.

Teaching Function #6. <u>Weekly and Monthly Reviews</u>

Students need additional review and practice on previously learned skills, concepts, and procedures. By providing periodic reviews and additional practice opportunities, the teacher enhances the likelihood that information will be retained. Good and Grows (in Rosenshine, 1986) recommended that teachers review the previous week's work every Monday, and the previous month's work every fourth Monday of each month. This distributed practice (in contrast to mass practice) has been well documented as an effective teaching practice (cf., Rosenshine, 1986).

Enabling Skills for Effective Lesson Structures

In order to ensure that lessons presented to students include all phases of instruction and that effective lesson structures are provided to students, there are numerous enabling skills to assist the teacher. For example, there are numerous techniques which have demonstrated support for gaining students' attention (e.g., reducing both stimulus complexity) that will assist the teacher in structuring lessons. Each of these enabling skills are reviewed below.

Enabling Skill #1. Gaining Student's Attention

(a) Use of Signals

The manner in which the attention of learners is gained can have a direct impact on the effectiveness of instruction. Teachers will be more effective if they use a consistent signal (the same signal every day) to indicate the beginning of the lesson and then wait for students' attention before proceeding. Consistent use of the signal increases the probability that students will be aware of exactly when instruction is beginning. Failure to employ consistent signals often results in students failing to focus their attention on instruction until several minutes after the lesson has begun.

(b) Seating Arrangements

Clark (1992) maintained that students' attention can be gained and maintained by maximizing seating arrangements. Salend (1990) in his review of research in this area, provided several recommendations for arranging student seating. When using small-group teacher-directed instruction, students should be seated in a semi-circle arrangement facing the teacher. In larger groups which are directed by the teacher, all students should be seated facing the teacher with their seats in rows, circles, or in a horseshoe arrangement. When students are expected to work together (e.g., cooperative learning activities), students should have their desks arranged in groups that face each other so that they can share information efficiently and quietly.

(c) Reducing Stimulus Complexity

Smith (1991) recognized that reductions in stimulus complexity are important in maximizing the attention of learners. Ineffective or novice learners may become overloaded when they are required to attend to more than 3 or 4 elements or ideas at a time. Additionally, they may attend to the perceptual features of stimuli rather than using their prior knowledge to problem solve. One way in which teachers can assist these students is by reducing the amount of material to which students are required to attend.

Structuring academic tasks so that a student's attention is directed toward the most critical features has been recommended (Smith, 1991). For example, Smith (1991) noted that younger children find vertical discriminations much easier than horizontal discriminations. Discriminations between the letters *b* and *d* may be easier for students when aligned vertically rather than horizontally. By extension, younger students may be able to read words better when aligned vertically rather than horizontally. To illustrate, reading the word "wagon" may be easier to read vertically as follows:

w
a
g
o
n

By adapting materials in this manner, teachers may reduce the complexity of unfamiliar words. Other suggestions to reduce stimulus complexity offered by Smith (1991) were to (a) address students' individual preferences for color, shape, or size, (b) use of three-dimensional visuals rather than two-dimensional visuals, and (c) present material concretely rather than abstractly.

Enabling Skill #2. Goal Setting/Communicating Lesson Goals

Reith and Evertson (1988) defined *goals* as the a teacher's "general aims for learning." Such aims, if carefully developed, form the basis upon which an instructional program can be built. Teachers who clearly communicate goals, rationales, lesson structures, and directions for their lessons have been found to be the most effective in increasing student learning (Berliner, 1988). One of the 14 major findings of the Beginning Teacher Evaluation Study was that structuring and giving directions on task procedures correlated positively wtih student success (Fisher et al., 1980). Brophy and Good (1986) in their more recent review of research, concluded that students learn more efficiently when teachers structure new information for students.

Enabling Skill #3. Teacher Motivation/Enthusiasm

Effective teachers are enthusiastic, motivated teachers (Kindsvatter, Whilen, & Ishler, 1988). When taught by these teachers, students become motivated and enthusiastic as well. Of all of the major techniques which teachers use to present their lessons, the skills related to motivation are the most important, especially in terms of encouraging, supporting, and stimulating students to learn. Good and Brophy (1984) identified two aspects of teacher enthusiasm. Effective teachers are very interested in *both* the subject matter itself *and* the dynamics involved in presenting the subject matter. As suggested by Gage and Berliner (1984), several studies have demonstrated that student learning is affected positively when teachers use an array of expressive behaviors (labeled *teacher's style* by these authors).

A *teacher's style* includes both verbal and nonverbal behaviors that teachers display during their instructional interactions with their students.

Students' motivation can be stimulated when the instructional approach is varied. A variety of instructional approaches, along with flexibility during teaching, have been cited as two major ways to both *gain* and *maintain* students' attention to the subject matter at-hand (Gage & Berliner, 1984; Good & Brophy, 1984). To sustain students' interest, a variety of methods has been found to be superior to the extended use of one method. Consequently, teachers need to make reflective decisions about how the "activity structures" they incorporate into their lesson structures. Variations in lesson structure (e.g., lecture, discussion, small group, etc.) and strengths and limitations of various lesson presentations are areas the teacher should consider before instruction begins. By "matching" the lesson content with the most facilitative lesson structure, the teacher can increase the potential that students will acquire the expected content-to-be-learned.

Enabling Skill #4. Lesson Entry

The first few minutes of the class period are the most crucial time in terms of teacher impact. The entry to the lesson is the students' first encounter with the content and method(s) to be used by the teacher. Teachers should plan lesson entry carefully, keeping in mind that the lesson entry is a crucial element in motivating students. Though lesson entry typically occurs at the beginning of the class period, entries may also be interspersed throughout the lesson as different segments of the lesson are presented. Kindsvatter, Whilen, & Ishler (1988) identify three primary purposes of lesson entry: (a) the entry focuses students' *attention* on the learning activity, (b) the entry *prepares* students for what they are going to learn, and (c) the entry *encourages* students to get involved. These authors presented several suggestions for capturing students' interest during the entry phase of the lesson. First, teachers can make causal or personal comments that indicate that they have interest in, and/or respect for, their students. Second, teachers can use a springborard to induce students to get involved with the goals of the lesson (e.g., relating the content to their lives and experiences). Third, teachers can gain students' interests by engaging in something unexpected (e.g., presenting a "shock" statement, providing students with a challenging puzzle). This element of surprise may stimulate students' curiosity, suspensiveness, or creativity and may serve as a challenge for them to get involved. Finally, teachers should consider using novelty during lesson entry. By incorporating novelty into the lesson entry, teachers can increase students' motivation and attention.

Critical to the success of a lesson entry is that teachers should orient students to the upcoming activity . Brophy and Good (1986) in their research review, concluded that students learn more efficiently and achievement is improved when the teacher structures the new information by linking the information to prior learning. Termed *set induction* by Alley and Ryan (1969), students retain more when teachers use set induction techniques. By relating the new information to-be-learned by students to their prior learning or personal experiences, the teacher has set the stage for the lesson to begin. Such relating allows learning to occur in a cumulative manner. Introducing new concepts, skills, and important facts are all essential during the lesson entry.

During the lesson entry, the teacher should also clearly delineate the *objectives* and *rationales* for the lesson and *describe any activity* in which students will be engaged during the lesson (Kindsvatter, Whilen, & Ishler, 1988). Clearly communicating lesson goals and objectives structures the lesson for students so that they are able to focus on the most important material, concepts, or skills to-be-learned during the lesson. By providing rationales for the lesson, the teacher communicates to students the relevance of the lesson to their lives and how the information learned can benefit them personally. Finally, by describing the activity to students, the teacher is setting the stage for high rates of student task engagement.

One specific technique which teachers can use to assist in lesson entry is the advance organizer. Discussed previously in the paper (see Principle 7, *Organizing and Activating Knowledge*), advance organizers refer to an array of activities designed to activate students' relevant prior knowledge. As Glover. Ronning, and Bruning (1990) suggested in their review, advance organizers that give readers an analogy for upcoming content, (a) are concrete and use concrete examples, and (b) are well-learned promote student learning.

Enabling Skill #5. Demonstration/Modeling

Effective modeling occurs throughout instruction. Ellis and Lenz (1992) have suggested that students master skills more readily when they have been explicitly identified and modeled by the teacher. The focus of such modeling is to enable students to understand the specific processes involved in the skill. Before modeling a specific aspect of the skill, the teacher should prompt students by cueing them for the critical features of the modeled activity and to identify those features as the activity is being modeled by the teacher. Ellis and Lenz (1992) further recommended that once a skill has been modeled, students should be involved in a series of continued activities where re-modeling of the skill occurs. Examples of re-modeling activities are: (a) students cueing the teacher as to what to do next, (b) having students label key behaviors as they are performed by the teacher, or (c) having students perform key behaviors as they are prompted by the teachers.

Ellis and Lenz (1992) also suggested that it is important for teaches to model how other, less obvious components of independent functioning can be integrated. By modeling self-coping statements (e.g., *"This is hard, but I can do it if I hang in there*), goal-setting behaviors (e.g., *"For the final exam, I'll review one chapter a night."*), coping with failure (e.g., *"I failed the quiz because I used the wrong strategy. Before the next exam, I'll try using a more effective one."*), and self-reinforcement (e.g., *I really did well on this project!*), the teacher serves as an effective role-model.

Herman (1990) stressed the importance of the teacher's role in mental modeling. Mental modeling requires that the teacher make visual mental reasoning processes associated with the skill being learned. (e.g., thought process involved in computing long division).

Enabling Skill #6. Rehearsal of Skill

Students need to engage in substantial rehearsal, particularly verbal rehearsal, of skills. Such rehearsal allows students the opportunity to elaborate and ultimately, recall the information learned. Teachers can promote this elaboration by prompting students to employ various cognitive processes (e.g., paraphrasing, summarizing, identifying main ideas and important details, predicting, generating questions, imagining, relating new information to personal experiences or interests) when interacting with the to-be-learned material (Ellis & Friend, 1991). Examples of activities that promote elaboration of content are the instructional pause procedure developed by Rowe (1976) and the retelling strategy described by Gambrell, Pfeiffer, and Wilson (1985).

Enabling Skill 7. Practice

(a) Guided or Controlled Practice

Research supports that demonstrations followed by guided or control practice result in improved student learning (cf. Stevens & Rosenshine, 1981). Controlled or guided practice is generally defined as practice that is characterized by teaching behaviors such as prompting, remodeling, questioning,and assisting . That is, while students engage in practice, teachers make themselves available to provide students with supportive assistance as needed. Of particular importance during this phase of instruction is that teachers should *carefully monitor* students through questioning to determine the extent to which they are responding correctly during the controlled practice.

During controlled practice, Ellis and Lenz (1992) described the teacher as a "coach" who prompts students to perform each component of the skill correctly. By providing these cues or prompts, students experience success every time the behavior is practiced. This form of instruction involves a gradual process of fading teacher prompts until students have effectively perform the skill without assistance from the teacher. Ellis and Lenz (1992) suggested that to maximize effectiveness when teaching a new skill, teachers first should demonstrate the behavior either with, or at the same time, as students while providing ample verbal prompts for what to do, what to check before proceeding, and so on. The intent of providing prompted practice is to ensure that students are correctly performing the behavior each time it is attempted. Less effective teachers will allow students to attempt the behavior, and then prompt only after they have run into difficulty. Thus, prompted practice should *ensure success throughout the process* of learning to apply the skill. Teacher prompts are gradually eliminated as students become both accurate and proficient in applying the new skill.

As noted by Ellis and Lenz (1992), most students require *extensive* and *intensive* practice of correct behaviors. Thus, if teacher prompts are needed to assure correct performance, then students are not ready for independent practice. This means that ifstudents have not yet mastered the new skill well enough to perform it without the help of the teacher, independent practice of the step should be either delayed until a later time, or the independent practice activity should focus on skills previously mastered.

(b) Independent Practice

Providing time for students to practice skills independently to the point of fluency and automaticity is an important aspect of the demonstration-practice-feedback paradigm. The Beginning Teacher Evaluation Studies (1978) have shown that the most successful teachers of reading and math give students time to practice these skills independently. Students in the average class spend 2/3 of their time working independently (although independent seatwork should be characterized by substantive interaction).

Homework is, or should be, designed to provide students with independent practice. Therefore, homework should be given which allows students to practice on previously learned skills, *not* on learning a new skill that has not yet been mastered well enough to perform independently (Ellis & Lenz, 1992). According to a comprehensive review of homework by Heller, Spooner, Anderson, and Mims (1988), the learning benefits of homework can be substantial for both high- and low-ability students. Although many studies conducted during the 1970s suggested that homework had negligible benefits, Heller et al. (1988) concluded that most of this studies were flawed by the failure to incorporate a common definition of homework. Since the 1970s, homework has been cited as one of the eight verifiable characteristics of effective schools (Glickman, 1985). By providing students with homework that is geared toward independent practice of previously learned skills, the full benefits of homework may be realized.

Enabling Skill 8. Lesson Closure

The closure to a lesson is the counterpart to the entry (Kindsvatter, Wilen, & Ishler, 1988). In most instances, closure occurs at the end of the lesson, although effective teachers may provide closure at the end of mini-segments of the lesson. Although little research has been undertaken to determine the impact of lesson closure, what research is available (cf. Gage & Berliner, 1984) suggests that closure is an important part of the lesson presentation used by effective teachers. Closure is that facet of the lesson in which the teacher reviews and summarizes the content of the lesson and bridges the lesson with a preview of the next lesson. Closure serves the purposes of reinforcing learning outcomes, integrating what has been taught, and assists students in making the transition to the next lesson (Kindsvatter, Wilen, & Ishler, 1988).

Kindsvatter, Wilen, and Ishler (1988) identified five elements that characterize effective lesson closure:

(a) Summary/Review

A major purpose of closure is the reinforcement of learning outcomes from the lesson. This reinforcement can occur when teachers spend a few minutes summarizing and reviewing the information learned. Teachers should use review to reinforce major terms, facts, and concepts. Reviewing may be comprised of teacher questioning or use of study guides reflecting the main points of the lesson. During the summary and review of the lesson, the teacher should determine the extent to which students have mastered the objectives of the lesson. This determination should guide the teacher in deciding whether to present new information in the next lesson or to reteach the content of the present lesson.

(b) Integration

During closure, teachers should attempt to help students synthesize the material learned during the lesson. Clarifying relationships and illustrating concepts and generalizations are examples of techniques that facilitate the integration process. Integration of material also encompasses a linkage of the lesson's objectives to the overall unit goals.

(c) Application

Teachers should discuss with students the manner in which the information acquired during the lesson can be applied in real-life settings. Helping students to see the utility and practicality of the information/skills is an essential part of closure.

(d) Transition

The closure of a lesson should facilitate the transition from one lesson to the next. This transition helps students to understand how the lesson fits into the "big picture" of the unit goals. By giving a preview of the next lesson, teachers are preparing students for the information to come and helping them to see the interrelationships among skills, information, and procedures to be learned.

(e) Reference to Accomplishment

By making reference to student accomplishment during closure, teachers provide students with feedback regarding their progress. Comments that refer to the accomplishment of students during the lesson also promote a positive social-emotional climate in the classroom. When refer to accomplishments, teachers need to *explicitly* relate the progress made by students to the objectives of the lesson.

First Phase

Reviewing Previous Day's Learning

Teacher Requires Students to Verbalize Meaning of Concepts and Apply the Concepts to Problems

Teacher Links New Information to Prior Learning

Communicating Lesson Goals and Expectations

Teacher Explicitly States the Goals of the Lessons

Preparing Students for the Upcoming Lesson's Activities

Teacher Communicates What is to be Learned,
What Students will be Doing, and
Why the Lesson is Important

Second Phase

Active Demonstration and Modeling

Teacher Models Concepts, Rules, or Procedures by
Focusing Students' attention on Relevant Dimensions, Providing
Examples and Non-Examples

Teacher Actively Presents Concepts, Explains Processes, and Demonstrates
How Students Should Regulate, Monitor, and Use a Concept, Rule, or
Procedure to Accomplish a Goal

Prompting and Cueing

Teacher Engages Students in High Levels of Responding Through Which Focus
Attention on the Relevant Features of the Concept

Controlled or Guided Practice

TeachersProvide Students Controlled or Guided Practice
of the Concept, Rule of Procedure Being Learned

Teacher Models the Procedure or Response by Verbalizing the Steps or the Correct Response
Aloud and then Leads Students to Perform the Response Using Prompts or
Cues to Guide Them Through Rehearsal of Each Procedural Step

Third Phase

Provision of Repeated Practice Opportunities

Teacher Provides Students with Sufficient Practice
to Ensure that Students are Confident and Firm in the Skill

Limited Teacher Prompting and Cueing

Teacher Fades Prompts and Cues as Students Become Independent

Systematic Error Correction Procedures

Teacher Systematically Corrects Students Until They are Consistently Correct in Their Responding

Figure 11. Phases of an Effective Lesson Structure

Critical Presentation Techniques

Overview

Process-product research has identified a number of effective teacher presentation techniques, or teacher behaviors, that impact student learning. Teacher behaviors involving questioning, management of student responding, pacing, and feedback have been identified as variables over which teachers have considerable control. Each of these presentations techniques are reviewed below, and best practices for the utilization of each are provided.

Presentation Technique #1: Teacher Questioning

Teachers ask many questions. Research on effective questioning has suggested that the typical social studies or science teachers ask approximately *150* questions per hour, and high school teachers ask *many hundreds* of questions per day (Gall, 1970). There are several areas teachers need to address when asking questions of their students. Among these are (a) the cognitive level of questions, (b) the relationship between questions and lesson objectives, (c) the manner in which questions are phrased, (d) adapting questions to the abilities of students, (e) the appropriate sequencing of questions, (f) the careful balancing of questions asked of volunteers and non-volunteers, (g) questioning designed to increase student participation and engagement, and (h) unison versus ordered questioning. Research has indicated that the decisions teachers make in each of these areas impact upon student learning.

(a) Cognitive Level

Generally, research has suggested that the cognitive level of teachers' questions are primarily low-order (i.e., basically recall or factual) questions when grouped according to Bloom's taxonomy (cf. Berliner, 1988). Trachentenberg (in Berliner, 1988) found that over 95% of teacher questions and questions from textbooks and tests were low-order questions. Gall (in Marksberry, 1979) found that 20% of teachers' questions require students to think at high cognitive levels, 60% require them to recall facts, and 20% are procedural in nature. Although higher-order questions (e.g., those aimed at synthesis and evaluation) are superior , low-order questions, at least to some degree, *do appear* to serve the positive functions of (a) engaging students at high rates of responding, (b) providing students with high rates of success, and (c) increasing student achievement levels.

When teachers ask higher-order questions, students achieve considerably more than when asked primarily low order questions (cf. Berliner, 1988). However, as Berliner (1988) noted, when teachers do ask higher-ordered questions, they often *receive* and *accept* student responses that do not match the cognitive level of the question. Research has suggested that the congruency of the cognitive level of teacher's questions to students' responses is approximately 50% (Kindsvatter, Wilen, & Ishler, 1988). An important conclusion from this research made by Berliner (1988) is that teachers need to be careful in their *acceptance* of student responses if they are to facilitate student learning at a cognitive level commensurate with the higher cognitive level at which questions are asked. One way in which teachers can promote higher cognitive responses is to provide students with *ample time* to respond. Rowe (in Berliner, 1974) found that students' answers to questions are of much better quality if teachers wait longer for students responses. Apparently, this increased time results in increased appropriateness of the response, increased student confidence in responding, and an increase in the cognitive level of the response. In their review, Kindsvatter, Wilen, and Ishler (1988), suggested that teachers should wait approximately 1 second after asking a question before calling on a student and wait 3-5 seconds for a student to respond after asking a question. Only after this ample length of time should teachers probe a response, rephrase or redirect the question.

Another way in which teachers can assist students to respond appropriately to the cognitive level of questions is to provide direct instruction to students regarding the cognitive levels of questions. By providing students with direct instruction regarding the cognitive levels of questions, teachers can assist students in understanding more clearly the cognitive response level they are expected to provide.

(b) Questioning and Lesson Objectives

When questioning, teachers should carefully analyze the objectives of the lesson to determine the cognitive level of questions to be asked of students (Kindsvatter, Wilen, & Ishler, 1988). Some objectives, are in fact, more easily met when primarily convergent questions are asked of students. Objectives which necessitate the use of convergent questions are aimed at getting students to recall factual information, such as those related to the major points and ideas of the lesson. Other objectives are better suited to the use of divergent questions. Lesson objectives that are best addressed through divergent questions are those that require that students to analyze and evaluate issues and problems. *Consequently, teachers should utilize the level of questioning which best matches the objectives of the lesson.*

(c) Question Phrasing

Questions need to be phrased clearly to communicate the response expected from students (Kindsvatter, Wilen, & Ishler, 1988). Vague or ambiguous questions lead to student confusion and frustration. Therefore, teachers should avoid ambiguity in questioning or asking questions that provide unclear expectations to students. Teachers should be cautious in their use of divergent questions as such questions are particularly susceptible to vagueness and ambiguity. This does not mean that teachers should refrain from using divergent questions. Rather, teachers need to carefully plan and phrase their divergent questions to avoid the communication pitfalls which may occur.

(d) Adapting Questions

Questions should be adapted to the *language* and *ability-level* of students (Kindsvatter, Wilen, & Ishler, 1988). In some heterogeneously-grouped classes, adapting questions is essential for student success. Questions that are phrased in simple, clear language increase the probability that *all* students will understand them. For more advanced students, thought-provoking questions should be provided. Conversely, for students with lower ability, questions need to be phrased in simple language, yet should be of sufficient challenge to students. Adapting questions necessitates that teachers spend considerable time *getting to know their students* so that they can appropriately adapt questions for them.

(e) Question Sequence

Teachers should carefully consider the sequence in which they ask questions. A well-planned and patterned sequence of questions appears to result in improved student learning. When planning questioning sequences, teachers must consider a number of variables including the objectives of the lesson, abilities of students, and the understanding students have of the content being addressed (Kindsvatter, Wilen, & Ishler, 1988).

(f) Balancing Volunteer and Non-Volunteer Responses to Questions

Student participation in class can be increased when teachers balance the number of questions asked of volunteering and non-volunteering students. As Kindsvatter, Wilen, and Ishler (1988) concluded, teachers too often rely on a few volunteering students to respond to the majority of their questions. When teachers expect contributions from *all* students, student participation is increased.

(g) Increasing Student Participation though Questioning

Pressley, Wood, Woloshyn, Martin, King, and Menke (1991) have suggested that by engaging in peer questioning, students are provided with opportunities to elaborate on the material to be learned. By asking questions and responding to them, students are clarifying, organizing, and reorganizing the material . This ultimately serves to facilitate deeper cognitive processing of the information.

Research seems to support student questioning participation. Peer tutoring results in positive learning gains for both the tutor and tutee (Webb, in Pressley et al., 1991). Additionally, research on reciprocal peer questioning has been quite encouraging in promoting student learning (King, in Pressley et al., 1991). By encouraging students to ask questions, they become more actively involved in the learning process. That is, when students ask questions, responses from other class members can be solicited, thereby promoting student-student interaction instead of the teacher-student exchanges that characterizes many classrooms.

Marksberry (1979) suggested that teachers need to *instruct* students to ask questions. Instruction regarding question forms, their uses, and their limitations should all be targeted for instruction. Kinds of questions which teachers can instruct students to ask include (a) yes-no questions, (b) who, what, when, where, why, and how questions, (c) questions that ask for agreement or support, (d) knowledge questions that call for information, (e) questions that ask for clarification, (f) analysis questions, and (g) evaluation questions.

(h) Calling on Students to Answer Questions

Ordered, predictable questioning has been positively and significantly correlated with student achievement (Sindelar, Bursuck, and Halle, 1986). Anderson et al. (1979) found that calling on students in ordered turns was the most efficient and efficient questioning method. Techniques such as calling on volunteers, calling on students randomly, and accepting student call outs have been reported to be inefficient questioning methods. However, Brophy and Evertson (1976) reported that for low-achieving students, accepting student call-outs did results in student achievement gains. They concluded that getting low-achieving students to respond in *any* fashion seems to result in improved achievement.

Presentation Technique #2: Teacher Management of Student Responses

(a) Frequency of Responses

Ellis and Lenz (1982) contended that teachers must provide students with frequent opportunities to respond. According to these researchers, a good rule of thumb is that for every three statements made by the teacher, students should make at least one response. Although students responses do not have to be complex, they should be frequently solicited. Teachers can cue students to make simple, efficient responses (e.g., Circling the correct answer on a response sheet) which enhance student involvement in the learning process. Also, Ellis and Lenz recommended that teachers engage students in unison oral or written responses to increase student attention and engagement (e.g., having students write responses on individual chalkboards and hold them up). When cueing unison responses, teachers can signal for students to respond and then check for student understanding or mastery.

Reluctant learners may have difficulty generating responses or answers, and teachers should make considerable effort to refrain from asking reluctant learners very difficult or threatening questions. By asking frequent questions that have a highly probability of a correct response, teachers can provide reluctant learners with the encouragement they may need to participate in the questioning-responding interaction. Also, teachers can assist these learners by providing them with alternative answers and allowing them to "pick the best one" (Ellis & Lenz, 1992).

Research has shown that teachers of normally and high-achieving students have a tendency to provide them with a greater length of time in which to respond than they do for low-achieving students (Stanley and Greenwood, in Meyen, Vergason, & Whelan, 1988). Teachers tend to give more eye contact and smiles to, as well as call on more frequently, their higher performing students than they do their lower-performing students. In other words, as Ellis and Lenz (1992) concluded, they are *better* teachers for their *better* students. The end result is that low-achieving students are provided with fewer opportunities to respond and are interacted with less by teachers. Consequently, teachers should (a) make every effort to provide *all* students with ample response time, regardless of their level of ability, (b) balance cues to respond throughout all class members, and (c) interact equally with all students.

(b) Adapting to Reduce Response Competition

One important finding is that ineffective learners often learn *incidental* rather than *relevant* information. That is, these students' attention may be drawn to the irrelevant attributes of an assignment, and the correct response often *competes* with irrelevant responses for the attention of these students. For example, some children may be distracted by pictures in text and thereby respond to misleading cues from pictures rather than attend to the relevant information provided in the text. Therefore, teachers should make efforts to minimize the irrelevant or distracting elements of the information to be learned by students.

Ellis and Lenz (1992) offered a number of suggestions for adapting materials to reduce response competition. First, teachers can provide content outlines which highlight the main ideas, major points, or most relevant information to be learned (e.g., content organizers). At times, the presence of similar information distracts students from learning more. Consequently, the reduction of similar items that may confuse or interfere with retrieval may be necessary. For example, a kindergarten teacher may elect not to teach "b" until "d" has been sufficiently mastered by students. By appropriately spacing instruction, teachers can minimize the opportunity for students to be distracted by similarities in instructional materials. Another suggestion offered by Ellis and Lenz is to provide students with a high-interest association when students are learning vocabulary words. For example, when learning the word, "humiliated," teachers can provide a high-interest association such as "I feel *humiliated* when people stare at me when I hum too loudly while wearing my walkman radio." Finally, information-to-be learned can be broken down into smaller segments so that response interference can be minimized.

(c) Response Variations

Group versus Individual Responding

Very little research has been conducted to determine the impact of group or choral responding (i.e., the entire group responds to a teacher signal simultaneously) on student achievement. What research is available is inconclusive, and is at times, contradictory. For example, Brophy and Evertson (1976) found that choral or group responding is negatively related to achievement. However, the Oregon Direct Instruction Follow Through program (in Ellis & Lenz, 1992), which relies heavily on choral responses, has obtained positive student achievement results through choral responding. This model incorporates both choral and individual responding at respective rates of 70% and 30%. Though used at a lower ratio, individual responding in this program allows teachers to periodically check the understanding of individual children.

Although research on choral responding is still inconclusive, Becker (1977) cited several advantages of choral responding to a teacher signal. First, it allows a teacher to monitor all students effectively and efficiently. Second, it allows the teacher to correct the entire group when an error is made (in contrast to embarrassing individual students when they are incorrect in their responses). Finally, choral responding makes responding game-like because the whole group participates in the activity.

In their review, Ellis and Lenz (1992) concluded that individual responses, whether oral or written, are desirable when wording is lengthy or when the response is likely to be different among students (e.g., "What is your opinion regarding the recent Supreme court ruling on abortion?").

(d) <u>Correctness of Student Responses</u>

As reviewed by Ellis and Lenz (1992), research suggests that when students give incorrect responses, the most appropriate teacher behavior is to ask (a) a simpler questions, (b) provide a hint to guide the student to the correct answer, or (c) give the student the process (or rule) to use to determine the answer. Thus, incorrect answers are best handled by helping the student to arrive at the correct answer (but not lingering too long) or by recycling the initial explanation. *However, simply giving the student the correct answer and then moving on is not positively related to achievement gain.*

When students are correct in their responses, research (cf. Ellis & Lenz, 1992) suggests that the most effective feedback method is for the teacher to ask a new question while maintaining the momentum of the practice. Short statements of praise and feedback indicating that the response was indeed a correct one should be provided to students. However, teachers should be careful in providing praise and feedback that are lengthy so as not to disturb the momentum of the lesson.

When students are correct but are hesitant or uncertain in their responses, it is important that teachers let them know that their answers were correct and to elaborate upon their responses to provide them with the additional confidence that need. Teachers can engage these students in elaboration by assisting them to understand *why* they were correct. For example, suppose a student was uncertain whether or not his answer to a particular problem involving subtraction with regrouping was correct. The teacher can engage this student in elaboration by asking him to describe the procedures he employed to arrive at the solution. While describing the process, the teacher can provide reinforcement for the use of correct procedures or identify area of problems within the procedures that may be contributing to student uncertainty.

Presentation Technique #3: Pacing Appropriately

Pacing is the speed at which students are moved through the information to be learned (Brophy, 1979). Effective pacing requires a match between student achievement and difficulty level of the assignment. Whereas slower students require a slower pace with frequent practice opportunities, average or high-achieving students need to be taught at a rather brisk pace (cf. Ellis & Lenz, 1992). For normal or high-achieving students, teachers need to (a) teach move rapidly through the curriculum by teaching more words, covering more pages per lesson, asking more questions, etc.

Reith and Evertson (1988) suggested that the organization of content and activities within a time frame may need to be adjusted for low-achieving students. Evertson (1982) found that sequencing the delivery of content into demonstration-practice-feedback cycles resulted in increased student learning for low achieving learners. With low-achieving learners or when material is particularly difficult, teachers should introduce materials in small steps, providing plenty of practice (i.e., to the point that students overlearn the material).

In general, teachers who aim for relatively high success rates before moving on produce more student achievement gains (Brophy, 1979; Ellis & Lenz, 1992). This finding appears to hold true for all learners. In fact, research data suggest that tasks should be presented that allow for high levels of student success (Brophy, 1979).

Glover, Ronning, and Bruning (1990), in their rev iew, concluded that *distributed* practice (i.e., the number of learning trials, each of brief duration, separated by a rest period) is superior to *mass* practice (i.e., the same number of trails performed immediately one after another). Distributed practice, then, does make a substantial difference in the amount of information students learn. By spacing practice, teachers can facilitate the learning process. As a cautionary note, however, there are some instances in which mass practice may be more beneficial. When introducing a difficult or new skill, such as complex mathematical equations, students may profit more when they have sustained time in instruction rather than brief instructional periods (Glover, Ronning, & Bruning, 1990).

Presentation Technique #3: Providing Feedback

Feedback to students is the provision of information to students concerning the correctness, quality, and remediation of their performance (Kindsvatter, Wilen, & Ishler, 1988). Bloom (in Kindsvatter, Wilen, & Ishler, 1988) has cited feedback as the most important teacher behavior in promoting student learning. Glover, Ronning, and Bruning (1990) made the following observations regarding feedback:

> All of us are familiar with the 'practice makes perfect maxim.' Like most maxims, it is only partially correct in that it fails to specify the sort of practice, the degree of perfection, and the amount of practice necessary. For example, sheer repetition leads to improvement only if some sort of feedback (information on consequences) is presented to the learner after each or most efforts to learn. Only with feedback will one show gradual improvement over time. When there is feedback, the frequency of the activity is a powerful determiner of the learning and the availability of basic knowledge. The more attempts you make with feedback, the more accurate you will become. With repetition and feedback, responses become more coordinated, more rapid, and more automatic. (p. 18).

These observations highlight the critical role that feedback plays in the identification of correct or error responses during the learning process (Perkins, 1988). As Berliner (1988) concluded in his review on feedback, substantial use of corrective feedback, contingent praise for correct responses, and the use of students' ideas as ways of letting students know that their contributions are valued . Each has been showed to be positively related to student achievement and attitude. Unfortunately, research has also shown that such feedback is not often found at high rates in many classes (cf. Berliner, 1988).

(a) General and Corrective Feedback

General feedback, which dichotomously identifies whether student responses or correct or incorrect (i.e., right only feedback for correct responses, and wrong-only feedback for indicate responses). General feedback has been extensively studied (cf. Perkins, 1988). Corrective feedback goes beyond the simple identification of errors and assists the learner to modify errors. That is, corrective feedback provides students with information about *how* they to correct their errors (Perkins, 1988). Bloom (in Kindsvatter, Wilen, & Ishler, 1988) stressed that students need to know the corrective procedures they should employed in their responding. Furthermore, Bloom believed that learning is dependent on student knowledge of the results of their responses so they can use that knowledge to correct future responses.

According to Levin with Long (in Kindsvatter, Wilen, & Ishler, 1988) the most effective feedback entails the following three components: (a) a definition of correctness or standard of performance to be met, (b) evidence indicating whether the standard was or was not achieved, and (c) corrective procedures as to what must be relearned and how it is to be learned. These three components have direct implications for teachers. First, teachers must endeavor to make clear the standard of performance expected of students. In addition, teachers should provide students with the evaluation criterion to be used to measure attainment of the performance standard. Teachers also should provide consistent and continuous feedback to the student relative to the progress toward attainment of the performance standard. Finally, teachers should give explicit feedback to students regarding the corrective procedures they are to take to reach the performance standard.

In reviewing studies of both general and corrective feedback, Perkins (1988) reached two conclusions. First, wrong-only feedback is superior to right-only feedback. Second, corrective feedback is superior to wrong-only feedback. One unfortunate finding by Bloom and Bourdon (in Perkins, 1988) was that teachers use general feedback much more often than corrective feedback. Additionally, Cohen, Perkins, and Newmar (in Perkins, 1988) found that on written tasks, feedback tends to be general, particularly when teachers are relying on rote memory or an answer key.

Perkins (1988) provided some insight into studies involving corrective feedback. Although interpretation of feedback of studies is limited because of problems in definition and arbitrary time intervals, Perkins believes that feedback studies are further compromised because they have not adequately controlled for the level of student task acquisition (e.g., acquisition or task proficiency stages). According to Perkins, results from those studies which have controlled for the level of task acquisition, indicate feedback impacts differentially, depending on the stage of student acquisition. That is, when students are in the acquisition stage, errors occur frequently and corrective feedback can *strengthen* the practice of correct responses. In contrast, corrective feedback may not be as critical for learners who are proficient in the skill.

(b) Providing Immediate and Frequent Feedback

The effective teacher provides *frequent* and immediate feedback to students (cf. Kindsvatter, Wilen, & Ishler, 1988). Consequently, teachers should grade papers, quizzes, and tests promptly. Additionally, teachers should quiz children frequently to provide the corrective feedback necessary for students to correct their errors in a timely manner. Finally, teachers should provide opportunities for students to learn from their errors by allowing students to correct their errors on assignments and then return those assignments to the teacher to verify their correctness.

(c) Using Peer and Self-Evaluation of Assignments

In their review, Kindsvatter, Wilen, and Ishler (1988) recommended the use of peer and self-evaluation as effective feedback techniques. When using these techniques, these educators suggested that teachers instruct students in the procedures, move among groups, answer student questions, and clarifying in those instances in which students are confused.

(d) Using Praise as a Form of Feedback

Using praise to reward student performance should be considered carefully by the teacher. Although praise can have a substantial, positive impact on student performance, the amount of praise given by the average teacher constitutes only 1% to 2% of the total class time (cf. Kindsvatter, Wilen, and Ishler, 1988). Although praise should be used consistently and frequently, teachers should use praise judiciously as research has indicated that if used inappropriately, praise can result in student insecurity and teacher overdependency (cf. Kindsvatter, Wilen, & Ishler, 1988). Additionally, if teachers praise every student response, participation may be rewarded but encouragement regarding the quality of response may be neglected as a result.

Kindsvatter, Wilen, and Ishler (1988) made several suggestions on using praise effectively to encourage student learning. First, teachers should praise in *specific reference* to the student progress in learning. By praising student attainment of, or progress toward, mastery of a specific skill, teachers are promoting student learning. Second, teachers can use praise by *acknowledging student ideas and contributions.* Rosenshine and Furst (in Kindsvatter, Wilen, and Ishler (1988) identify five ways teachers can use student ideas or contributions:

- A student's contribution can be acknowledged by the teacher by repeating the response aloud to the class with the student's name.
- A student's contribution can be acknowledged by the teacher when the student's idea is expressed in different words to make it more understandable by the class.
- A student's contribution can be acknowledged by applying the student's response to some situation or by using it to explain some event.
- A student's contribution can be acknowledged by comparing the student's response to something in the text, lesson, or similar event.
- A student's contribution can be acknowledged by summarizing the student's ideas and using them to make a point.

Finally, Kindsvatter, Wilen, and Ishler (1988) recommended that teachers make efforts to make their nonverbal behavior congruent with verbal praise. That is, research has suggested that teacher nonverbal behavior "peaks louder" than teacher verbal behavior. Examples of negative nonverbal messages include lack of teacher eye contact while giving praise, unwillingness to touch a student, or rarely calling on certain students in the class.

Figure 12 provides set of teacher guidelines for the use of effective praise (Brophy, in Kindsvatter, Wilen, & Ishler, 1988). Additionally, this figure contrasts effective with ineffective praise. The information provided in this figure should prove helpful for the educator in using praise judiciously.

(e) Using Criticism as Feedback

Criticism is used twice as much as praise as a form of feedback (Amidon & Flanders, in Kindsvatter, Wilen, & Ishler, 1988). Many studies have identified criticism as an impairment to learning, student self-concept, and motiva..n (cf. Kindsvatter, Wilen, & Ishler, 1988). However, there are times when criticism may be both appropriate and serve as a corrective function. When used constructively, criticism, if emotionally neutral, has been found to be accepted by students. In contrast to constructive criticism, it has been understood for many years that criticism in the form of sarcasm and personal attach are negatively related to achievement and should not be used to correct inappropriate behavior (cf. Kindsvatter, Wilen, and Ishler, 1988). Ignoring inappropriate behavior and using other more positive behavior modification techniques have proved to be effective techniques is changing student behavior (cf. Berliner, 1988).

Kinsvatter, Wilen, and Ishler (1988) made the following points regarding the use of constructive criticism:

- Criticism should be referenced to the action or product that is not acceptable.
- The reasons why the action or product is not acceptable should be explicitly stated.
- The teacher should indicate to the student what she or he can do correct the action or product.
- The teacher should get back to a pleasant tone with the student as soon as possible.
- The teacher should never criticize the student, only the action.

(f) <u>Written Feedback</u>

Using written comments as feedback can be a valuable teaching technique. By writing comments on papers, teachers communicate to students that they are concerned enough to take the time to write thoughtful messages. However, teachers should make comments specific enough so that students are aware of when they need to continue in their responses or when areas need to be improved or relearned (Kinsvatter, Wilen, & Ishler, 1988).

Kulhavy (1977), in an interesting research review on feedback on written responses, concluded that when teachers explicitly let students know whether or not their responses are correct test performance is improved. However, Kulhavy made several conclusions which provide insight into the differential ways that feedback can impact student learning. *Correct answers*, unlike incorrect errors, have a remarkable tendency to perseverate to later tests, regardless of whether or not feedback is provided by the teacher. That is, even when feedback indicating that a student's response was correct is not provided, students tend to make the same response on later tests. Providing feedback regarding student errors, however, appears to be far more important than confirming the correctness of student answers. Kulhavy pointed out that feedback regarding errors can impact in two ways. First, when student confidence regarding the response is high and the response was in fact a *correct* one, feedback probably receives only cursory student attention. However, when student confidence is high regarding a response and the response was in fact, *incorrect*, feedback is greatly facilitative in both gaining student attention and in correcting future response to the question on tests. From his review, Kulhavy concluded that it is essential that teachers provide corrective feedback, particularly when students responses are incorrect.

Figure 12. Effective and Ineffective Praise

Effective Praise	*Ineffective Praise*
1. is delivered contingently	1. is delivered randomly or unsystematically
2. specifies the particulars of the accomplishment	2. is restricted to global positive reactions
3. shows spontaneity, variety, and signs of credibility; suggests clear attention to student's accomplishment	3. shows a bland uniformity that suggests a condition response made with minimal attention
4. rewards attainment of specified performance (can include performance criteria)	4. rewards mere participation without consideration of performance
5. provides information to students about their competence or the value of their accomplishments	5. provides no information at all or gives students information about their status
6. orients students toward better appreciation of their own task-related behavior and thinking about problem solving	6. orients students toward comparing themselves with others and thinking about competing
7. uses students' own prior accomplishments as the context for describing present accomplishments	7. uses the accomplishments of peers as the contexts for describing students' present accomplishments
8. is given as recognition of noteworthy effort or success at (for this student) tasks	8. is given as recognition without regard to the effort expended or the meaning of the accomplishment
9. attributes success to effort and ability, implying that similar successes can be expected in the future	9. attributes success to ability alone or to external factors such as luck or (easy) task difficulty
10. fosters endogenous attributions (students believe that they enjoy the task and/or want to develop task-relevant skills)	10. fosters exogenous attributions (students believe that they expend effort on the task for external reasons - to please the teacher, win a competition or reward, etc.).
11. focuses students' attention on their own on their own task-relevant behavior	11. focuses students' attention on the teacher as an external authority who is manipulating them
12. fosters appreciation of, and desirable attributions about, task-relevant behavior after the process is completed	12. intrudes into the on-going process, distracting attention away from task-relevant behavior

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