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ABSTRACT

This article discusses the idea that overt verbalization helps to develop children's self-regulated learning of cognitive skills. It points out that (1) verbalization can enhance children's attention to task-relevant features; (2) as a type of rehearsal, verbalization may improve coding, storage, and retention of material, and thereby facilitate subsequent retrieval and use; (3) verbalization can help children maintain a positive task outlook and cope with difficulties; (4) because verbalization makes salient a systematic approach for improving learning and children's ability to apply it, verbalization also can raise self-efficacy (perceived capabilities). Research is summarized that assesses the effects on children's learning of verbalizing information to be remembered, modeled actions, and strategies. Collectively these findings support the notion that verbalization is a key process that can help develop self-regulated learning among children. Concluding remarks suggest that future research should explore maintenance and generalization of systematic approaches to learning, verbalization of task-specific and general statements, and uses of verbalization in classrooms. (Author/RH)

Self-Regulation Through Overt Verbalization During Cognitive Skill Learning

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Abstract

This article discusses the idea that overt verbalization helps to develop children's self-regulated learning of cognitive skills. Verbalization can enhance children's attention to task-relevant features. As a type of rehearsal, verbalization may improve coding, storage, and retention of material, and thereby facilitate subsequent retrieval and use. Verbalization can help children maintain a positive task outlook and cope with difficulties. Because verbalization makes salient a systematic approach for improving learning and children's ability to apply it, verbalization also can raise self-efficacy (perceived capabilities). Research is summarized that assesses the effects on children's learning due to verbalizing information to be remembered, modeled actions, and strategies. Future research needs to explore maintenance and generalization of systematic approaches to learning, verbalization of task-specific and general statements, and uses of verbalization in classrooms.

Self-Regulation Through Overt Verbalization During Cognitive Skill Learning

Recent theoretical accounts of learning view learners as active seekers and processors of information rather than passive recipients (Bandura, 1986; Brophy, 1983; Corno & Mandinach, 1983; McCombs, 1984; Schunk, 1985; Winne, 1985). There also is much evidence that personal expectations influence achievement behaviors. Although research has been conducted within various theoretical traditions, they are united in their emphasis on students' beliefs concerning their capabilities to exercise control over important aspects of their lives (Bandura, 1986; Brophy, 1983; Covington & Omelich, 1979; Rotter, 1966; Schunk, 1985; Thomas, 1980; Weiner, 1979).

The focus of this article is on self-regulated learning, which refers to the process whereby students' cognitions manifest themselves in planful behaviors oriented toward learning (Corno & Mandinach, 1983; Winne, 1985; Zimmerman & Pons, in press). Students' cognitions include such activities as attending to instruction, processing and integrating information, rehearsing, thinking, and problem solving, as well as beliefs concerning capabilities for learning and the anticipated outcomes of learning (Brophy, 1983; Corno & Mandinach, 1983; Schunk, 1985; Winne, 1985).

In this article, I discuss the idea that overt verbalization is a key process that can help develop self-regulated learning among children. By verbalization, I mean overt private speech, which refers to the set of speech phenomena that has a self-regulatory function but is not socially communicative (Fuson, 1979). Private speech is speech directed toward the self (Harris, 1982). Its content can include information to be remembered, rules, strategies, beliefs about one's ability to learn, and so on; in short,

its content comprises student cognitions that are relevant to learning. Although the bulk of my remarks will focus on overt verbalization by children as they engage in cognitive-skill learning, it should be noted that private speech is a broad concept that includes both overt (out loud, whispering) and covert (internal) speech during engagment on motor, cognitive, and perceptual tasks (Harris, 1982).

My plan in this article is to initially present some theoretical perspectives on the role of verbalization in the development of self-regulated learning. I then will summarize research from different areas that explores the effects of verbalization on children's learning. I will conclude by offering some suggestions for future research.

Theoretical Perspectives

Private Speech

Cognitive-developmental theory establishes an important link between private speech and self-regulation. Vygotsky (1962) believed that private speech helped to develop thought through its role in organizing behavior. Children employed private speech to help them understand situations and surmount difficulties. Vygotsky hypothesized that private speech followed a curvilinear developmental pattern in that overt verbalization (i.e., thinking out loud) increased until ages 6-7, after which it declined and became primarily covert by ages 8-10; however, overt verbalization could occur at any age when people encountered obstacles.

Luria (1961) postulated three stages in the development of verbal control of motor behavior. Initially, the speech of others is primarily responsible for directing the child's behavior (ages 1.5-2.5). During the second stage (ages 3-4), the child's overt verbalizations can initiate motor behaviors but

not necessarily inhibit them. The child's private speech becomes capable of initiating, directing, and inhibiting motor behaviors between ages 4.5-5.5. Luria believed that private speech directed behavior through neurophysiological mechanisms, and that private speech might be especially beneficial with children possessing developmental problems (Harris, 1982).

Research exploring children's spontaneous private speech during task engagement has shown that, although the amount of private speech decreases from about ages 4 or 5 to age 8, the proportion of private speech that is self-regulating increases with age (Fuson, 1979). In the typical investigation, the actual amount of private speech is quite small, and many children do not verbalize at all (Fuson, 1979). In short, the developmental pattern of private speech seems more complex than originally hypothesized by Vygotsky (1962).

In discussing deficiencies in children's spontaneous use of private speech, investigators have distinguished between production and mediational deficiencies (Flavell, Beach, & Chinsky, 1966; Kendler, Kendler, & Wells, 1960; Reese, 1962). A production deficiency refers to the failure to generate such task-relevant verbalizations as rules, strategies, and information to be remembered, in situations in which they could improve task performance, whereas a mediational deficiency occurs when task-relevant verbalizations are produced but do not affect children's subsequent task behaviors (Fuson, 1979; Harris, 1982). It should be noted that these two labels describe children s failure to verbally self-regulate behaviors, but do not explain why verbal self-regulation fails to occur (Paris, 1978).

From a cognitive-developmental perspective, a theoretical account of the link between private speech and self-regulation is as follows. Very young

children produce verbalizations that do not mediate performance. Subsequently, children develop the ability for verbalizations to mediate performance but may not produce the relevant verbalizations at the appropriate times. With development, children learn to produce task-relevant verbalizations when they might benefit performance (Fuson, 1979). This developmental model seems to pertain better to situations requiring relatively simple types of verbal self-regulation (e.g, rehearsal) than to situations calling for more complex verbalizations, in which production and mediational deficiencies may coexist and not follow a simple progression (Fuson, 1979).

More recently, investigators have shown that, once children are successfully trained to produce relevant verbalizations to aid task performance, they often discontinue use of private speech when no longer required to verbalize (Fuson, 1979). This continued-use deficiency may occur because children do not fully understand that use of private speech benefits their performances (Borkowski & Cavanaugh, 1979). It also is possible that, although children believe that verbal self-regulation is useful, it is not as important for success as are such factors as time available or effort expended (Fabricius & Hagen, 1984). To promote maintenance of verbal self-regulators following training, researchers have suggested providing children with information linking task-relevant verbalizations to improved performance and with training on when and where to verbally self-regulate their performances (Borkowski & Cavanaugh, 1979; Baker & Brown, 1984; Paris, Lipson, & Wixson, 1983).

Instructional Processes

Theory and research on instructional processes provide a second line of evidence supporting the role of verbalization in the development of

self-regulation Although students' cognitive activities during instruction typically are initiated by aspects of the instructional environment (Marx, 1983), students' activities also influence instructional processes, as when students ask the teacher questions about material they do not understand.

Various cognitive processes are postulated to bear a reciprocal relationship with instructional events (Winne, 1985). Attending includes focusing on incoming information, as well as activating concepts in memory. Coding is employed to translate information into a form compatible with the processing system. Associating refers to relating new information with information in memory. Rehearsing involves maintaining information in an activated state without altering it. Monitoring includes such processes as comparing one's level of learning to the perceived goals of instruction and deciding whether further learning is needed.

Any of these cognitive processes seem amenable to verbal self-regulation by learners. There are several hypothesized mechanisms whereby verbalization could enhance self-regulated learning. Verbalization may help children attend to important task features and disregard irrelevant ones. As a form of rehearsal, verbalization also should assist coding and retention of information. Third, verbalization can assist monitoring, as when students who are reading material to be comprehended periodically stop and attempt to summarize what they have read.

One suggestion for facilitating children's self-regulated learning is to have them cognitively transform information to be acquired, rules, strategies, and so on (Borkowski & Cavanaugh, 1979). Cognitive transformations include such activities as sorting, clustering, and rephrasing, all of which lend themselves to verbalization. In line with current thinking on instructional

processes, greater learner cognitive activity presumably results in better encoding, retention, and retrieval (Borkowski & Cavanaugh, 1979).

A instructional procedure that seems compatible with the development of self-regulated learning is self-instructional training (Meichenbaum, 1977). During the cognitive modeling phase, a child observes a model perform a task and simultaneously verbalize the appropriate rules and procedures being applied. The model then verbally instructs the child while the child performs the task (overt guidance), after which the child generates overt instructions while performing. The child next whispers the instructions while performing (faded self-guidance), and eventually performs the task silently (covert self-instruction). Types of statements that typically are modeled include: problem definition (e.g., "What is it I have to do?"), focusing of attention ("I need to pay attention to what I'm doing"), planning and response guidance ("I need to work carefully"), self-reinforcement ("I'm doing fine"), self-evaluation ("Am I doing things in the right order?), and coping statements ("I need to try again when I don't get it right"). In addition to its benefits on coding, retention, and retrieval of instructional material, self-instructional training may help create a positive task outlook among learners and foster perseverance in the face of difficulties (Meichenbaum & Asarnow, 1979).

Research suggests that verbalization during instruction may be most beneficial for children who typically perform in a deficient manner (Denney, 1975; Denney & Turner, 1979). Benefits have been obtained with children who do not spontaneously rehearse material to be learned, impulsive subjects, learning disabled and retarded students, and remedial learners (Schunk, 1985). Verbalization may help such children work at tasks in a systematic manner

(Hallahan, Kneedler, & Lloyd, 1983). In contrast, verbalization may not facilitate performance when children can adequately handle the task demands. Verbalization even could hinder children's performances because it constitutes an additional task and could distract children from the task at hand (Denney, 1975).

Modeling and Self-Efficacy

Support for the hypothesized relationship between verbalization and self-regulation also can be found in Bandura's (1986) conception of human functioning as reciprocal interactions between behaviors, cognitions and other personal factors, and environmental events. People are not passive recipients of environmental forces, but rather actively self-regulate their behaviors. They set their own standards for performance, and assess the discrepancies between their goals and their actual performances. When their behaviors fall short of their goals, people are apt to display greater motivation toward goal attainment by creating personal incentives, arranging favorable environmental conditions, and employing the necessary cognitive activities and behaviors to develop skills (Bandura, 1986).

An important means of acquiring skills and performance standards is observational learning through modeling (Bandura, 1986; Rosenthal & Bandura, 1978; Rosenthal & Zimmerman, 1978). Observational learning comprises four processes: attention, retention, production, and motivation (Bandura, 1986). Observer attention to relevant environmental events is necessary for them to be meaningfully perceived. Retention activities include coding and transforming modeled information for storage in memory, as well as cognitively rehearsing information. Production involves translating visual and symbolic conceptions of modeled events into overt behaviors. Motivation refers to how

the outcomes of one's or others' actions (successes, failures), as well as the consequences of outcomes (e.g., praise, reproof), influence observers' use of skills or knowledge acquired through observation.

Verbalization is amenable to the processes of observational learning. Observers who are instructed to verbalize a model's actions may attend to them more closely, and verbalization should assist their coding and retention. Verbalization during production may provide a helpful means of translating modeled events stored in memory into behaviors. Verbalization also can enhance motivation, such as when observers verbalize self-reinforcing statements typically included in self-instructional training.

An important cognitive mechanism influencing learning and behavior change is perceived self-efficacy, or personal beliefs about one's capabilities to organize and implement actions necessary to attain designated levels of performance (Bandura, 1982b, 1986). Self-efficacy can affect choice of activities. People who hold a low sense of efficacy for accomplishing a task may attempt to avoid it, whereas those who believe they are more capable should participate more eagerly. Self-efficacy also is hypothesized to affect effort expenditure and persistence. Especially when facing obstacles, individuals who hold a high sense of efficacy ought to work harder and persist longer than those who doubt their capabilities (Bandura, 1982b). Individuals acquire information for gauging their self-efficacy from their actual task accomplishments, vicarious experiences, forms of persuasion, and physiological indexes (Bandura, 1982b).

Verbalization is hypothesized to be an important means of increasing self-efficacy (Schunk, 1985). As noted previously, verbalization can direct children's attention to important task features, assist strategy encoding and

retention, and help children work in a systematic fashion. As such, verbalization can indirectly convey to students that they are acquiring knowledge and skills. The belief that one has learned can raise children's self-efficacy for continued learning (Schunk, 1985). Verbalization also makes salient to children rules and strategies that improve their performance and that they are capable of skillfully applying them. Knowledge that one has at one's disposal a method that can aid learning conveys to children a sense of personal control over learning outcomes, which can enhance self-efficacy (Bandura, 1982a; Schunk, 1985).

Research Evidence

In this section I will present some research investigating verbalization effects on children's learning. For purposes of organization, I have grouped research studies into three areas: verbalization of information to be remembered, modeled actions, and strategies. This review does not represent an exhaustive search of the literature; rather, I have selected representative studies in each area. There is obvious overlap in these areas; for example, much strategy training research includes modeled demonstrations. I will offer a collective summary of the findings in the concluding section of this article.

Information to be Remembered

Flavell et al. (1966) explored children's spontaneous use of verbalization during a serial recall task. Children in grades kindergarten, two, and five, observed an experimenter point to pictures of objects one at a time. Children attempted to reproduce the sequence immediately or after a short delay. Kindergartners were less likely than older children to rehearse the object names during the delay. Older children also demonstrated better

serial recall (immediate and delayed) than younger children. This study showed that young children may not spontaneously produce task-relevant verbalizations that could improve their performances.

Keeney, Cannizzo, & Flavell (1967) administered a serial recall task to children (ages 6-7) and identified spontaneous rehearsers and nonrehearsers. The nonrehearsers, who demonstrated poorer serial recall, were given training in which an experimenter pointed to pictures and children repeated aloud the objects portrayed. Children easily learned the rehearsal strategy and improved their recall performance; however, when no longer constrained to employ the strategy, they abandoned it. Keeney et al. interpreted the results as evidence for a production deficiency, and suggested that informing children of the benefits of rehearsal on their performances might have promoted maintenance.

Asarnow and Meichenbaum (1979) presented kindergartners with a serial recall task and identified nonrehearsers and inconsistent rehearsers. Subjects were assigned to either a self-instructional training, induced rehearsal, or practice control condition. Self-instructional training was patterned after the guidelines discussed earlier (Meichenbaum, 1977). Induced rehearsal children repeatedly verbalized aloud the names of pictures as they were presented, and also pointed to the pictures in sequence. Practice control subjects were shown the pictures and advised to think of a good way to remember their sequence. Nonrehearsers who had received either self-instructional or induced rehearsal training outperformed the controls on an immediate posttest, but only self-instructional subjects maintained their performances at this higher level after one week. Inconsistent rehearsers showed a gradual increase in recall from pretest to follow-up regardless of

treatment condition. Children's actual rehearsal paralleled these recall findings.

Levin, Ghatala, Wilder, and Inzer (1973) explored the effects of verbalization on children's discrimination learning. Fourth graders were presented with homonym word pairs (e.g., flower-flour), synonym pairs (rug-carpet), and unrelated pairs (bed-fence). One member of each pair was underlined. Some children (vocalization) were instructed to pronounce the underlined word three times, whereas others (imagery) were told to form an image of it. Controls were given no strategy instructions. Vocalization promoted discrimination learning of synonyms better than the other two conditions; however, imagery and vocalization were equally effective and better than the control condition for unrelated words. The three conditions did not differ for homonyms. These results suggest that verbalization can provide auditory cues that should aid learning except when the cues are not distinctive.

In a follow-up study (Levin, Ghatala, DeRose, Wilder, & Norton, 1975), fifth and sixth graders participated in discrimination learning of pictures or of verbal labels corresponding to the pictures, and were assigned to a vocalization, imagery, or control condition. Vocalization and imagery produced significantly better performance for words than did the control condition, but vocalization led to better performance on pictures than the other two conditions. Levin et al. (1975) noted that verbalization may require different types of cognitive processing depending on the stimulus materials. With words, verbalization may lead to better performance due to enhanced attention and acoustic effects, whereas with pictures, verbalization may require interpretive cognitive processing.

Taylor, Josberger, and Whitely (1973) assigned educable mentally retarded children to either an imagery or a sentence elaboration condition; within these conditions, half of the subjects verbalized aloud. Children were presented with noun pairs. Imagery subjects were instructed to form a mental image of each noun pair doing something together. Sentence elaboration subjects were instructed to make up a sentence or short story about the two things doing something together. All subjects verbalized their elaborations at the beginning of training, after which half of the subjects were instructed to no longer verbalize. Continued verbalization promoted recall more than discontinued verbalization in both the imagery and sentence elaboration conditions. Taylor et al. suggested that verbalization may have contributed to subjects' continued production of elaborations throughout training.

Whitely and Taylor (1973) trained junior high school students to generate imagery elaborations between word pairs; half of the subjects verbalized their elaborations aloud. During the second phase of training, half of the subjects who had verbalized were instructed to no longer verbalize aloud. Verbalization during the first training phase enhanced subsequent recall, and there was no decrement in recall due to discontinuing verbalization. Whitely and Taylor concluded that verbalization may be discontinued once it fosters a change in children's covert cognitive processing.

Hagen, Hargrave, and Ross (1973) showed preschool and early elementary school children pictures of animals. Children verbalized the name of each animal as it was shown, along with the preceding pictures in the series. Half of the children received experimenter prompting; the experimenter pointed to and said the name of the animal if children did not respond correctly. Rehearsal plus prompting improved children's recall more than rehearsal

without prompting, and this effect was more pronounced among the younger subjects.

Kramer and Engle (1981) presented normal and retarded children with training on list learning (pictures, numbers, letters). For half of the subjects, training included rehearsal in which an experimenter rehearsed the items on a list, after which children repeated the experimenter's words. Half of the subjects within the rehearsal training and no rehearsal training conditions also received a strategy awareness treatment: Children were informed that breaking a list into smaller parts and practicing saying the names of the items could help them remember the list. Rehearsal training improved recall on immediate and delayed tests involving the training task, but not on a generalization task. Strategy awareness improved subjects' ability to verbalize strategic behaviors, but not their use of rehearsal or their recall.

Modeled Actions

Bandura, Grusec, and Menlove (1966) showed a film to children (ages 6-8), in which an adult model displayed a variety of unusual behaviors with toys. While watching the film, children either verbalized aloud the actions of the model, counted aloud (competing verbalization), or did not verbalize. Children subsequently were asked to reproduce as many of the model's actions as they could recall. Children who had verbalized the model's actions reproduced more of them than subjects in the other two conditions. Passive observation led to greater reproduction than competing verbalization.

Coates and Hartup (1969) exposed children (ages 4 and 7) to a filmed model performing novel actions. Induced verbalization subjects first heard the experimenter describe the model's actions and then repeated the

description; free verbalization subjects described the model's actions in their own words; children in the passive observation condition silently watched the film. Following the film, children attempted to reproduce the model's actions. Among the older children, free verbalization led to poorer performance than induced verbalization and passive observation. Among the four-year-olds, free verbalization led to better performance than passive observation, but lower performance than induced verbalization. These results offer evidence for a production deficiency among younger children in that verbalization promoted their performances, and also show that verbalization may not benefit older children.

Zimmerman and Bell (1972) assigned fifth graders to a verbal description, irrelevant verbalization, or passive observation condition. Subjects observed an adult model nonverbally demonstrate either an associative or a conceptual rule. While the model performed, verbal description subjects verbalized the model's actions, irrelevant verbalization subjects counted aloud, and passive observation subjects silently observed. Children were given an immediate and a delayed test on the training task and on a generalization task. Regardless of phase of study or type of rule, passive observation led to better performance than verbal description and irrelevant verbalization. Rule conditions did not differ on the immediate tests, but conceptual rule subjects outperformed associative rule subjects on the delayed tests. Given that the model did not state the rule, children's verbalizations may have interfered with their attempts to induce it.

Denney and Turner (1979) assigned children (ages 3-10) to a strategy modeling, strategy modeling with overt verbalization, or control (no training) condition. Modeling subjects observed an adult model perform various

cognitive tasks (e.g., twenty questions, match-to-standard) while verbalizing aloud task-relevant strategies, and performed the tasks themselves. Children in the strategy modeling with overt verbalization condition verbalized aloud as they performed. Both modeling conditions were equally effective in facilitating children's performances, which supports the idea that verbalization may not result in any benefits.

Denney (1975) assigned children (ages 6-8) to an exemplary modeling, cognitive modeling, cognitive modeling with self-rehearsal, or no model condition. Children in the three modeling conditions observed an adult model repeatedly perform a twenty questions task while verbalizing the questions, after which the child performed the task. In the cognitive modeling conditions, the model also verbalized a performance strategy. For the self-rehearsal component, the child verbalized a set of four questions prior to performing the task. Cognitive modeling alone improved children's performances more than cognitive modeling plus self-rehearsal. Denney suggested that the rehearsal may have distracted children from the task at hand.

Swanson and Henderson (1977) assigned Papago Indian children (ages 3-6) to one of three conditions: TV modeling, TV modeling plus participation, control. TV modeling subjects viewed videotapes portraying Papago adults, who were dressed as themselves or as animals, model causal question asking. After viewing each tape, participation children observed a live model ask questions, after which children asked questions themselves. Children were tested a few days, as well as two weeks, later. TV plus participation led to more causal question asking on both occasions. TV modeling subjects performed better than the controls on the posttest, but not on the delayed test.

Strategies

Much research has employed verbalization in the context of problem solving or as a means of training students to use strategies while working at tasks. A strategy, or cognitive plan, is a set of sequenced cognitive operations that students apply to information to complete a task (Kinne, 1985).

Gagne and Smith (1962) explored how verbalization affected problem solving. The task (Tower of Hanoi) was to reproduce a stack of disks such that only one disk could be moved at a time and a larger disk could not be placed on top of a smaller one. Boys (grades 9-10) were assigned to either a verbalization or no verbalization group; within these conditions, half of the subjects received a solution set. Verbalization subjects stated aloud why they made each move as they made it. Solution set subjects were instructed to think of a general rule for solving the problem. Verbalization improved performance, but only as the number of disks to be moved increased. No benefits were obtained for solution set instructions. With practice, subjects verbalized general strategies more often than specific moves. Gagne and Smith concluded that verbalization may have forced subjects to think of new reasons for their moves.

Wilder, Draper, and Donnelly (1984) also employed the Tower of Hanoi problem. Subjects (learning disabled and nondisabled high school students) either verbalized aloud a reason for each move, thought of a reason but did not verbalize it, or were given no verbalization instructions. The results for moves in excess of the minimum showed that learning disabled students benefited most from overt verbalization, whereas nondisabled students' performance was best under covert instructions. It is possible that the

learning disabled students did not properly utilize covert instructions to guide their performances.

Schunk (1982) investigated how different forms of verbalization influenced elementary school children's division skills and self-efficacy. Subjects received instruction and practice opportunities over sessions. One group verbalized only explicit steps (e.g., "check", "subtract", "bring down") while solving problems; a second group verbalized on their own (free verbalization); a third group (combined) verbalized the steps and on their own; and children in a fourth condition did not verbalize. Children who had freely verbalized - alone or combined with strategy verbalization - demonstrated the highest division skill. The combined treatment led to the highest self-efficacy for solving division problems. By itself, strategy verbalization led to no benefits compared with no verbalization. Schunk suggested that, because strategy verbalization was not oriented toward actual application of the strategy to problems, children may have learned the descriptors without fully understanding how to apply them. Verbalizing a strategy, along with its application, may have created a sense of control over learning, which can promote self-efficacy (Schunk, 1985).

Schunk and Rice (1984) explored the effects of strategy verbalization with remedial readers. Children in grades 2-4 received instruction and practice in listening comprehension. An adult model verbalized and applied a listening comprehension strategy that included specific steps (e.g., "What is it I have to do?", "I must find the correct picture"). Half of the children in each grade verbalized the steps prior to applying them to questions; the other half received instruction but did not verbalize the steps. Strategy verbalization led to higher self-efficacy across grades, and promoted

performance among third and fourth graders. Perhaps the demands of verbalization, along with those of the comprehension task, were too complex for the second graders. They may have focused their efforts primarily on the comprehension task, which could have interfered with strategy encoding and retention.

In a follow-up study (Schunk & Rice, 1985), children in grades 4-5 received instruction and practice in reading comprehension. Within each grade, half of the subjects verbalized strategic steps prior to applying them to passages (e.g., "Read the questions", "Look for key words"). Strategy verbalization led to higher reading comprehension and self-efficacy. Children also judged the importance of causal attributions (i.e., perceived causes) for their performances during the training program. Children who had verbalized the strategy placed more importance on ability as a cause of their successes than subjects who had not verbalized the strategy. The latter finding suggests that strategy verbalization may enhance self-efficacy through its effects on ability attributions.

Schunk and Cox (in press) investigated how strategy verbalization influenced learning disabled students' self-efficacy and learning of subtraction skills. Middle school students (grades 6-8) received subtraction instruction and practice opportunities over sessions. During the problem solving, one group verbalized aloud subtraction solution steps and their application to problems (continuous verbalization); a second group verbalized aloud only during the first half of the training program (discontinued verbalization); a third group did not verbalize. Continuous verbalization led to higher posttest self-efficacy and skill than the other two conditions, which did not differ. It is possible that, when instructed to no longer

verbalize aloud, discontinued verbalization students had difficulty internalizing the strategy and thus did not utilize covert instructions to regulate their performances. They also may have felt that the strategy was useful but that other factors (e.g., effort, time) were more important for solving problems. In contrast, continuous verbalization may have made highly salient to students the effectiveness of the strategy for solving problems and their ability to apply it.

Palkes, Stewart, and Kahana (1968) trained hyperactive boys to perform such tasks as matching familiar figures and embedded figures. Subjects were instructed to verbalize explicit commands prior to responding (e.g., "I look and think before I answer"). Subsequent performance on the Porteus Maze test revealed a significant benefit of training compared with a no-treatment control group. In a follow-up study (Palkes, Stewart, & Freedman, 1972). hyperactive boys were assigned to either a verbal training group, a silent reading group, or a control group. Verbal training was identical to that of Palkes et al. (1968); silent reading subjects were instructed to read the steps in the strategy prior to performing. Verbal training led to significantly higher Porteus Maze performance compared with the other two conditions, which did not differ; however, the improved performance due to verbal training was not maintained on a 2-week delayed test. Palkes et al. (1972) suggested that verbalization, rather than exposure to the strategy, improved performance, and that repeated training might promote strategy maintenance.

The remainder of this section summarizes research employing self-instructional training (Meichenbaum, 1977). Meichenbaum and Goodman (1971) presented impulsive second graders with self-instructional training on

a variety of motor and cognitive tasks. Compared with subjects who received training without the self-instructions, self-instructional children demonstrated longer response latencies on a matching familiar figures test following training. In a second study, some subjects observed an experimenter demonstrate and verbalize the application of a matching familiar figures strategy, whereas others received modeling plus self-instructional training. Modeling slowed down subjects' decision times, but the addition of self-instructional training resulted in significantly fewer errors.

Jackson and Calhoun (1982) trained preschool children on block design tasks. Some children received self-instructional training; others (overt verbalization) received self-instructional training except that verbalizations were not faded to a covert level. In a third (external instruction) condition, children were verbally directed by the experimenter. On the posttest and a one week follow-up test, overt verbalization resulted in better performance than the other conditions, which did not differ. Jackson and Calhoun noted that self-instructional children experienced difficulty fading verbalizations to a covert level; they preferred overt verbalization and had to be repeatedly prompted to use covert instructions (e.g., whispers, lip movements).

Davis and Hajicek (1985) utilized self-instructional training to teach behaviorally disordered children to multiply decimals. The comparison treatment (strategy training) involved experimenter modeling and verbal guidance of students' responses. Self-instruction led to greater increases in both problem solving accuracy and student attention.

Robin, Armel, and O'Leary (1975) provided kindergartners with self-instructional training on printing letters. Compared with a direct

training treatment that included experimenter feedback and social reinforcement, self-instruction led to more accurate printing on the training tasks, but no generalization was obtained on other letters or forms. Although the children verbalized many self-instructions, amount of self-instructions did not predict printing performance. Many children tended to bypass steps in the self-instructional sequence. Robin et al. suggested that children may not have developed sufficient printing skills for them to generalize to new tasks.

Borkowski and Varnhagen (1984) trained mentally retarded children on an anticipation strategy for serial recall and on a paraphrase strategy for gist recall of sentences. Children either received self-instructional training, strategy training through didactic instruction, or no instruction (control). Strategy maintenance was assessed one and three weeks after training; tests for generalization were given periodically on gist recall of stories. The self-instructional and strategy training conditions promoted performance equally well on the maintenance tasks, which may have occurred because of the similarity of content of the two training procedures. On the final generalization test, recall was higher for the two experimental conditions compared with the control condition. There was some evidence for generalization of strategy use by the self-instruction subjects. Borkowski and Varnhagen noted that self-instructional training may promote generalization to the extent that the training includes statements on executive skills (e.g., strategy selection, monitoring) in addition to the usual task-specific statements.

The issue of generalization was explored by Schleser, Meyers, and Cohen (1981), who tested first and second graders on a training (matching familiar figures) and generalization (perceptual perspective-taking) task. During

training, some children were instructed to use specific self-instructions oriented toward performing the training task, whereas others received general self-instructions that applied to many tasks (e.g., "I have to stop and think about what the question is asking"). Other conditions included a specific and a general didactic condition in which the same content was delivered but children did not employ self-instructions, and a no-training control group. Although specific self-instructions led to higher performance on the training task, general self-instructional training resulted in better performance than all other groups on the generalization task.

Brown, Meyers, and Cohen (1984) trained preschoolers on mazes, size sequencing, and the concepts of same and different. Children were assigned to a self-instructional, skills training, or no-treatment control condition. Skills training included the same problem solving instruction provided to self-instructional children but not the modeling or verbalization components. The self-instructions combined task-specific instructions with more generic ones. Self-instructions led to greater performance on generalization tasks than did the other two conditions, which did not differ.

Schleser, Cohen, Meyers, and Rodick (1984) assigned first and second graders to either a didactic instruction, faded self-instructional, directed discovery self-instructional, or no-training control condition. The didactic treatment presented the same instructional content as the self-instructional conditions except that children did not verbalize the instructions. Children in the discovery group were led to discover the instructions through a Socratic-type exchange with the experimenter. Relative to the other two conditions, subjects in the two self-instructional conditions significantly improved their performance on the training task (matching familiar figures).

Subjects in the discovery group who previously had been classified as concrete operational based on their conservation task performance demonstrated the greatest improvement on a generalization task (perceptual perspective taking).

Thackwray, Meyers, Schleser, and Cohen (1985) compared the effects of general and specific self-instructional training on maintenance and generalization of a strategy for solving addition problems. Subjects were third and fourth graders with academic deficiencies. The specific self-instructional treatment instructed children to use an addition strategy, whereas the strategy taught in the general self-instructional treatment could be applied to a range of mathematical tasks. Subjects in a third condition received didactic instruction on the same content as contained in the specific self-instructional treatment, but did not verbalize. Specific self-instructional training improved performance on a mathematics test following training, but the general self-instructional treatment led to higher performance on generalization tasks (spelling, general information).

Summary and Recommendations

The studies in the preceding section demonstrate that verbalization can improve children's learning of information, modeled actions, and strategies, as well as their self-efficacy for performing tasks. Collectively, these findings support the notion that verbalization is a key process that can help develop self-regulated learning among children.

Readers undoubtedly are aware that, in many of the studies summarized in the preceding section, the influence of verbalization on children's learning is not disentangled from the effects of other treatments. Self-instructional training, for example, comprises modeling, guided practice, overt and covert verbalization. Nonetheless, some research shows that the verbalization

component promotes learning beyond the effects of other instructional aspects (e.g., Meichenbaum & Goodman, 1971). The benefits of verbalization cannot be due to differential instruction, because many studies included comparison treatments in which children did not verbalize but received the same amount and type of instruction (e.g., Schunk & Rice, 1984, 1985). Nor is amount of verbalization the critical element (Schleser et al., 1981). If children do not focus their verbalizations on relevant material, no amount of self-talk will lead to skill acquisition (Schunk, 1982).

There are various ways that verbalization might operate to improve children's self-regulated learning. Verbalization helps to focus students' attention on important task features rather than on irrelevant information (Fuson, 1979). As a means of rehearsal, verbalization also can assist students in organizing, coding, and storing information in memory, which should improve future retrieval and use (Denney, 1975). Verbalization can help children maintain a positive task orientation and cope with difficulties by including self-reinforcement and coping statements (Meichenbaum & Asarnow, 1979). By making salient a strategy that can assist performance, along with children's successes in employing that strategy, verbalization can create a sense of personal control over learning. Greater perceived control raises self-efficacy, and higher self-efficacy promotes task motivation and learning (Bandura, 1982a; Schunk, 1985).

At the same time, the benefits of verbalization must be qualified. There is evidence that the proportion of private speech that is self-regulating increases as children mature (Fuson, 1979). Among young children, overt verbalization may interfere with performance of the task at hand, and they may have difficulty fading verbalizations to a covert level (Jackson & Calhoun,

1982; Schunk & Rice, 1984). The cognitive status of the children also places constraints on the effectiveness of verbalization. Verbalization seems most beneficial for children whose typical performances are somehow deficient (e.g., mentally retarded, learning disabled, remedial, impulsive). Verbalization may help such children work at tasks more systematically (Hallahan et al., 1983). Verbalization may not improve performance when children otherwise can handle the demands of the task (Denney & Turner, 1979). Because verbalization constitutes an additional task, it even could hinder performance if it interfered with children attending to and processing information relevant to the primary task (Denney, 1975).

Some suggestions for future research are discussed below. This research should enhance our understanding of the theoretical mechanisms whereby verbalization facilitates children's self-regulated learning, and should suggest how verbalization can be effectively incorporated into classroom instructional procedures.

Maintenance and Generalization

Many studies investigating the effect of verbalization on children's learning have not addressed whether the learning maintains itself over time or generalizes (transfers) to other tasks. Studies that have explored either or both of these issues report mixed results (Borkowski & Varnhagen, 1984; Kramer & Engle, 1981; Meichenbaum & Goodman, 1971; Palkes et al., 1972; Robin et al., 1975; Schleser et al., 1981). Maintenance and generalization of systematic approaches to learning are critical aspects of self-regulation, and future research needs to explore ways of facilitating them.

There are various possibilities why children, once they have been trained to self-regulate their performances, may not maintain or generalize a

systematic approach to learning (Baker & Brown, 1984). Children may believe that the approach is of limited usefulness and that other factors (e.g., effort, time available) have greater effects on performance. Children often have naive ideas about when a method for learning may be useful (Fabricius & Hagen, 1984; Myers & Paris, 1978). With respect to generalization, it is possible that children cannot transform the method they have been taught to fit the new task. Even minor modification of a systematic approach to learning may prove difficult, especially among children with cognitive deficits (Borkowski & Cavanaugh, 1979).

Brown and her colleagues have emphasized that cognitive skills training needs to include practice in the use of skills, instruction in how to monitor the outcomes of one's efforts, and feedback on when and where a strategy may be useful (Brown, 1980; Brown, Palincsar, & Armbruster, 1984). Among children with cognitive deficits, maintenance and generalization may not occur following training programs of short duration (Palkes et al., 1972). When children do not receive extensive practice in the use of skills, they may not fully understand how to apply them outside of the training context. Along these lines, Borkowski and Cavanaugh (1979) suggest training children on multiple tasks, because training on only one task can engender the belief that the trained method has limited applicability.

One implication of the suggestions by Brown and her colleagues is that children may benefit from being provided with explicit information on a value of a systematic approach to learning; that is, how using this means of self-regulation results in improved performance. Value can be conveyed by noting that other children's performances improved when they employed the method being taught (Borkowski & Varnhagen, 1984; Schunk, 1982). Another

means for conveying value is by verbally linking children's successes with proper implementation of the method (e.g., "That's correct. You got it right because you applied the steps in the right order").

To promote generalization may require explicitly training children to transform the systematic approach to learning to fit new tasks (Borkowski & Cavanaugh, 1979). Greater cognitive activity during training can lead to better strategy coding, retention, and retrieval. A systematic approach for self-regulating learning may include both general statements (e.g., "What is it I have to do?"), as well as task-specific statements ("I must check to see whether I have to borrow"). When children are taught to verbalize statements while working on different tasks, they may require explicit instruction on which statements can be used on all tasks, which statements need to be modified, and how to modify the latter.

Task-Specific Versus General Statements

Research needs to explore in greater depth how the content of children's verbalizations affects performances on different tasks. Intuitively, one might expect that task-specific verbalizations would facilitate performance on the training task but would not transfer to other tasks, whereas general statements might prove effective on both training and transfer tasks. There is some evidence to support these ideas (Kendall & Wilcox, 1980; Schleser et al., 1981; Thackwray et al., 1985). Research has not explored whether verbalization of task-specific and general statements differentially affect children's self-efficacy.

From the perspective of self-regulated learning, it seems important to teach children general statements that apply across tasks, as well as how to modify task-specific statements to fit the particular task at hand. A

training program might begin with task-specific statements, and gradually integrate general statements as children are simultaneously trained how to modify task-specific statements to fit different tasks (Harris, 1982). Training on how to modify statements may be especially important for children with cognitive deficits (Borkowski & Cavanaugh, 1979).

Applications to Classrooms

Research needs to explore effective methods for utilizing verbalization to facilitate self-regulated learning in classrooms. Most of the preceding research was conducted outside of classrooms; subjects were trained individually or in small groups. Overt verbalization cannot be used indiscriminantly in classrooms; an entire class verbalizing simultaneously would undoubtedly prove distracting to some children.

The research evidence suggests that verbalization may be quite useful as part of a remedial training program for students who have failed to acquire skills despite repeated classroom instruction. Because these students could be trained to verbalize individually or in a small-group setting, their verbalizations should not prove disruptive to the other class members.

With its inclusion of fading of verbalizations to a covert level, self-instructional training seems highly applicable to classrooms. When using self-instructional procedures in classrooms, Meichenbaum and Asarnow (1979) suggest that the statements be succinct and capture the essence of the process being taught. A statement such as, "Check my work" is readily understood by children and, because it may involve several operations, will not have to be uttered often. Another advantage of short statements is that they can be represented verbally or in pictorial form on charts that are displayed near student work areas. This type of instructional aid reduces the need for

constant teacher interaction; rather, teachers would be primarily concerned with monitoring student progress.

Meichenbaum and Asarnow (1979) also recommend training students on general metacognitive skills, or those concerned with monitoring one's learning and taking corrective action as necessary. One procedure that lends itself well to such metacognitive training is goal setting (Schunk, 1985). A systematic approach for learning how to set goals and evaluate progress could include verbalization of statements that addressed what the overall instructional goal is, how much time is available, how the task can be divided into subparts, how much time could be devoted to each subpart, and so on. As students work at the task, they could verbalize the relevant statements at the appropriate places to monitor their level of learning and decide whether they require additional practice. Used in this fashion, verbalization may prove especially effective in helping students acquire a general self-regulated approach to learning.

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