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# The effects of self-verbalization on the performance of proficient and less proficient learners

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# THE EFFECTS OF SELF-VERBALIZATION ON THE PERFORMANCE OF PROFICIENT AND LESS PROFICIENT LEARNERS

by

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## Abstract

THE EFFECTS OF SELF-VERBALIZATION ON THE PERFORMANCE OF PROFICIENT AND LESS PROFICIENT LEARNERS

by

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This study investigated how model verbalization and self-verbalization of strategies influenced 46 proficient and 43 less proficient six- to nine-year olds' performance on a difficult maze. Students in the first condition observed a model verbalize strategies and were then instructed to verbalize strategies themselves. Those in the second condition observed the model verbalizing but did not self-verbalize. Those in the third condition viewed a silent model and were instructed to self-verbalize while solving a posttest maze. In the fourth condition students viewed the silent model and did not self-verbalize. A control condition worked without viewing a model. Self-verbalization of strategies led to better performance at follow-up for the less proficient students. Proficient students who self-verbalized after observing a silent model showed diminished performance at follow-up. Paivio's (1971) dual coding theory is discussed in relation to the interference effect observed

with the proficient learners.

Self-efficacy judgments were positively correlated with performance; however, they did not differ by treatment condition. This study also investigated whether a state orientation as defined by Kuhl (1981) is associated with less proficient performance. The state orientation scale did not distinguish proficient and less proficient learners.

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## Introduction

Self-verbalization is a procedure which has been used to help children regulate their own learning and performance. Although various self-verbalization procedures have been taught to children in an effort to modify both learning and performance, there is considerable disagreement in the literature over the issue of whether self-verbalization training adds anything beyond direct instruction or modeling. Studies have found equal improvements in strategic behavior whether or not children were instructed to verbalize (Denney & Turner, 1979; Reid & Borkowski, 1987). Others have found greater improvements among subjects trained to self-verbalize compared to those receiving only modeling (Meichenbaum & Goodman, 1971) or direct instruction (Schleser, Meyers, & Goodman, 1981).

A closer examination of studies in the self-verbalization literature indicates that they vary in the intended focus of the training. Some researchers have successfully employed a self-verbalization procedure to help children who demonstrated a clear deficiency in a specific academic skill such as subtraction (Schunk & Cox, 1986). Others have taught hyperactive subjects to self-verbalize in an effort to modify more general performance behaviors such as hyperactivity or impulsivity (Meichenbaum & Goodman, 1971). Studies have

varied in the specificity with which subjects' deficiencies were defined and training was conducted. An examination of the literature on self-verbalization reveals more consistently positive results for the procedure when learners are demonstrably deficient in the use of specific strategies or procedures than when their deficits are defined in more global performance terms such as hyperactivity and impulsivity. In an effort to explain the inconsistencies in the literature, I will focus on the differential effectiveness of self-verbalization for proficient and less proficient learners.

An examination of the literature on self-verbalization also reveals little understanding of how the procedure helps learners regulate their performance. Early studies were derived from a model suggested by Vygotsky (1962) and Luria (1961) which postulates that verbal control of behavior passes through stages of increasing internalization, i.e., from external adult control to internal self-control. Results of naturalistic studies of private speech (Roberts, 1979; Fuson, 1979) have failed to support this model.

Many early experimental studies (Meichenbaum & Goodman, 1971) used a procedure based on the steps in Luria's (1961) model of increasingly internal verbal control over behavior. This procedure is termed self-

instruction training. A number of studies revealed it was not necessary to include all the steps derived from the Lurian model (Mednick, 1986; Schunk, 1982; Schunk & Cox, 1986). Meichenbaum and Goodman (1979) suggested that the sequence and steps by which private speech develops naturally may not correspond to the most effective procedure for training students in self-verbalization for the purpose of modifying performance. Based on this reasoning and on the lack of empirical support, the model suggested by Vygotsky and Luria is not likely to provide an adequate explanation for how self-verbalization has enabled some learners to regulate their performance.

Bandura's model of self-regulated learning (1986) is proposed as an alternative to the model originally postulated by Vygotsky and Luria. Bandura has suggested that self-verbalization procedures have been effective because they provide the learner with task-directed strategies which take the place of negative and disruptive self-referent thought. This explanation is supported by results of naturalistic studies that show that less competent learners tend to spontaneously use private speech that is negative and self-evaluative (Roberts, 1979; Zivin, 1972, cited in Fuson, 1979). Additional support for Bandura's explanation is provided by experimental studies which show that performance on tasks can be improved by interrupting subjects' tendencies to

focus on negative, self-referent thought and instructing them to verbalize statements relevant to problem-solving (Kuhl, 1981). Kuhl terms the self-evaluative stance of the less proficient learner a state orientation and believes that a more positive action orientation is fostered by having subjects verbalize hypotheses while problem-solving.

There are no studies to date which have compared the differential effectiveness of self-verbalization training for learners of different levels of proficiency. The proposed study sought to provide some clarification of the conditions under which self-verbalization procedures are effective by comparing these two types of learners. The study provided a test of the hypothesis that less proficient performance is associated with a state orientation as well as the idea that self-verbalization training is effective for less proficient learners but not for more proficient learners.

The literature on self-verbalization training will be reviewed along two sets of parameters. First, studies that compared self-verbalization procedures to modeling or direct training without self-verbalization will be reviewed. Second, the self-verbalization literature will be reviewed in terms of the subject population used: whether subjects' deficiencies were defined in a global behavioral way or in terms of task-specific deficiencies.

A brief review of the Vygotsky and Lurian models will be presented with an explanation of why Bandura's social cognitive theory provides a more complete framework for understanding verbal self-guidance during learning and performance.

## Chapter Two

## Review of the Literature

### Self-verbalization versus Direct Training

Psychometric tasks. The most frequently studied self-verbalization training strategy is self-instruction. The training is comprised of five steps: cognitive modeling, external guidance, overt self-instruction, faded self-instruction, and covert self-instruction. Typically the content components include: problem definition, response guidance, attention focusing, self-reinforcement, and error coping. Most studies have included all the types of self-instructional statements; however, a few have varied content components.

Early studies of self-instruction training often used as the training task the Matching Familiar Figures psychometric test. Meichenbaum and Goodman (1971) introduced the self-instruction procedure as a strategy for helping hyperactive children control their impulsive responding. These researchers were successful in both increasing latencies and decreasing errors on the MFF

(Matching Familiar Figures). This study and a similar one by Bender (1976) found self-instruction superior to cognitive modeling without self-instruction.

Schleser, Meyers, and Cohen (1981) pretested, trained and posttested first and second graders on the MFF. These children did not have any identified deficiencies. Children taught to self-verbalize specific statements subsequently made fewer errors than those given direct training or taught general self-instructions. Specific statements included four of the components suggested by Meichenbaum and were designed for the specific training task (e.g., "I have to look real close at each part of this picture"). General statements also included task-relevant, self-guiding, self-monitoring, and self-reinforcing statments but were designed to provide a broad problem-solving strategy (e.g., "I'm going to answer a question: I have to stop and think about what the question is asking"). In another study preschoolers from low income families were pretested, trained, and posttested on the Block Design subtest of the WISC-R (Jackson & Calhoun, 1982). Those youngsters trained to use overt self-verbalizations performed significantly better at posttest than those trained in covert self-verbalization, those receiving instruction, and those in a practice control group.

Kendall and Finch (1978) used a procedure combining

response cost with self-instruction training. Impulsive 10- and 11-year olds were pre- and posttested on the MFF. Materials used for training were similar but not the same as the MFF. The self-instruction groups improved significantly more than a control group which received "similar conditions as did the treatment group" (p.113) but no self-instruction training. Response cost for the control group was not contingent on performance. Improvements included decreased errors and increased latencies. It should be noted that positive results may have been due to the response cost procedure that was used in addition to self-instruction training. Another study employing a very similar methodology (Kendall & Braswell, 1982) failed to find a difference between self-instruction training and a behavioral treatment in which the therapist modeled appropriate behavior and reward and response contingencies were used. Impulsive children in both groups showed improvements in MFF errors and latencies, the WRAT spelling achievement test, and the WRAT math test. A control group given the opportunity to practice the training tasks did not show comparable improvements.

Strategies. A few studies have explored the use of self-verbalization in the training of strategies for other types of cognitive tasks. Denney and Turner (1979) trained children 3-10 years old on four cognitive tasks:

a signal task, a match-to-standard task (similar to MFF), a paired associates task, and a twenty questions tasks. A condition in which the experimenter modeled the strategy was as effective as one in which the child was instructed "talk out loud to yourself about how to play the game just like I did."(p. 124).

Reid and Borkowski (1987) used two cognitive tasks, paired associates and sort recall, to test the effectiveness of general self-instructions versus self-instructions plus attribution training for second-, third-, and fourth-grade hyperactive children. Both training groups and a control group received strategy training. Results indicated that the group trained in self-instructions plus attributions used more complex strategies than the other two groups which did not differ.

Although the two previously reviewed studies failed to find differential effects for self-verbalization training and direct instruction, Asarnow and Meichenbaum (1979) found that kindergartners who did not spontaneously use a rehearsal strategy during initial testing on a serial recall task benefitted more from self-instruction training than from direct instruction to rehearse. Those children who were already using a rehearsal strategy or were using it inconsistently showed equal improvement whether they practiced the task,

received instructions to rehearse, or were trained to use self-instructions. The primary factor explaining the positive results in this study is probably subject characteristics. Those subjects who initially demonstrated no knowledge of the strategy benefitted most from a procedure emphasizing the value of the strategy.

Wilder, Draper, and Donnelly (1984) compared the performance of normal and learning disabled high school students on the Tower of Hanoi problem. Students were given one of three sets of instructions: the overt group was instructed to say aloud a reason for each move they made, the covert group was told to think of a reason to themselves, the control group was given only the basic instructions of the game. Results indicated that learning disabled students benefitted most from the overt instructions, although non-learning disabled students benefitted the most from covert instruction.

In conclusion, studies examining the relative effectiveness of self-verbalization and direct training for strategy learning on psychometric or cognitive tasks have produced mixed results. Several studies indicate that direct training can be as effective as self-instruction (Denney & Turner, 1979; Reid & Borkowski, 1987). Others suggest the superiority of self-instruction over modeling (Meichenbaum & Goodman, 1971) or direct training (Bender, 1976). A few studies suggest

that subject characteristics such as learning disabilities (Wilder et al., 1984) or strategy knowledge (Asarnow & Meichenbaum, 1979) may interact with self-verbalization strategies. Subjects who are less proficient in strategy usage may show more benefit from training in self-verbalization than subjects who demonstrate partial knowledge of strategies.

Academic Tasks. Self-verbalization techniques have been used more often in recent years to help students improve performance on academic tasks. Davis and Hajecek (1985) trained severely behaviorally disordered students (9-15 years old) who were not able to do decimal multiplication. Initially, modeling of correct strategies was provided, and students improved their rate of accuracy. After self-instructional training was added to the procedure, even greater improvements in accuracy occurred.

Schunk (1982) taught long division strategies to 9-11 year old students who were identified by teachers as not possessing this skill. Those subjects instructed to construct their own verbalizations improved more in division skill than those who were trained to repeat one word strategy steps (e.g., "check," "multiply"). This latter group did not differ from a no verbalization control group. The author suggests that rote-like repetition of the single word steps may have resulted in

inadequate understanding of how to apply them. Another study in which sixth, seventh, and eighth graders were trained to verbalize while learning subtraction with regrouping found greatest improvements for those subjects instructed to verbalize continuously (Schunk & Cox, 1986). Students instructed to verbalize only during the first half of training improved but significantly less. Verbalizations were self-constructed ("...say out loud what you're thinking about, just as I did...") as in the other Schunk (1982) study.

A few other studies have failed to find differential effects for self-instruction compared to other training procedure. Robert and Mullis (cited in Roberts & Dick, 1982) taught arithmetic skills to impulsive first graders. Equal improvements were seen among groups receiving behavioral modeling, verbal modeling, and complete self-instruction training. Mednick (1986) found that children's long division performance improved equally whether they were in one of four possible training conditions. These included self-instructing while solving problems, observing a partner work problems and self-instruct, working problems while a partner self-instructed, and self-instructing while a partner worked the problems.

Thackwray, Meyers, Schleser, and Cohen (1985) trained academically deficient third and fourth graders

on addition problems and then tested them on a math quiz, the Peabody Individual Achievement Test, and a teacher rating scale. Children receiving training in specific self-instructions improved significantly on the PIAT math subtest compared to those receiving didactic training or training in general self-instructions. However, on a math quiz composed of the same kinds of problems used in training, all groups improved.

In a number of studies researchers have taught self-verbalization procedures to students in an effort to improve performance on reading tasks. Fifth-grade poor readers improved more when they were trained explicitly to use self-instructions than when similar behaviors (task clarification, cognitive rehearsal, self-reinforcement, coping with errors) were modeled for them (Malamuth, 1979). On the other hand, Borkowski and Varnhagen (1984) found that self-instruction training and traditional direct instruction were equally effective for helping educable mentally retarded children improve on a serial recall task and gist recall of three-phrase sentences. The authors do report that two of the six subjects receiving self-instruction training transferred the training to a generalization task.

One study compared self-instructions to direct training for improving kindergartners printing skills (Robin, Armel, and O'Leary, 1975). Although self-

instruction training led to greater improvements on the specific letters trained than did direct instruction, the improvements did not generalize to letters not trained.

Studies comparing self-instruction training and direct instruction as strategies to improve academic learning and performance have produced the same pattern of inconsistent results seen in the studies using psychometric and cognitive tasks. Although some studies found a positive effect for self-instruction training for both math and reading tasks (e.g., Davis & Hajecek, 1985; Schunk & Cox, 1986), others failed to find a difference in effectiveness between self-instruction training and other procedures (Borkowski & Varnhagen, 1984; Mednick, 1986). Based on this pattern of results it is still not possible to say whether self-verbalization strategies add something to traditional direct instruction and modeling procedures.

## Self-verbalization and Learner Competency

### General definitions of learner deficiency.

Self-verbalization may be differentially effective under certain conditions and not under others. An examination of the self-verbalization literature suggests that the definition of learner competency may be one factor which accounts for the inconsistency of results found in the literature. Self-instruction was originally promoted as

a strategy to help hyperactive children slow their impulsive responding and perform more reflectively. With this purpose in mind, the target tasks in early studies were very sensitive to impulsive responding. Subject populations were often defined in terms of a psychiatric diagnosis of hyperactivity or through teacher identification of impulsive, hyperactive, or disruptive behaviors.

Two early studies using hyperactive eight- to nine-year-old boys as subjects and the Porteus Mazes as the criterion task indicated positive results (Palkes, Stewart, & Freedman, 1971; Palkes, Steward, & Kahana, 1968). Subjects trained to self-verbalize general commands such as, "Stop -- Listen. I look and think before I answer" showed more improvement than those who had only practice on the training materials. These studies did not answer the question whether self-verbalization training adds anything beyond direct training, as there was no didactic or modeling control group. It seems probable that improvements in performance were due to a slowing effect that the requirement to verbalize had on subjects' impulsive responding.

The classic study of self-instruction training conducted by Meichenbaum and Goodman (1971) included two experiments. In the first experiment subjects were

identified in a general way according to placement in a special class for children who demonstrated hyperactivity and poor self-control. Although self-instruction training was effective for improving performance on the Porteus Mazes and several WISC subtests, it did not result in fewer errors on the MFF. A subsequent experiment used a different criterion for inclusion: an absence of improvement on a parallel form of the MFF when instructed to go slowly. With this criterion of specific deficiency on the target task, subjects trained to use self-instructions did show a greater decrease in errors relative to those receiving only modeling.

Cameron and Robinson (1980) rated children on the Connors Scale and a New Zealand scale for hyperactivity. Using a multiple baseline design they found that children trained to use both self-instructions and self-management techniques showed significant improvements in math accuracy. Self-instruction training was emphasized on the first two days of training, and self-management was added on the third day. This study is not a test of the effectiveness of self-instruction training alone because subjects used self-management techniques as well during all but two of the twelve training sessions.

Hyperactive children identified by scores on the Connors were also used as subjects by Bugental, Whalen, and Henker (1977). Half the children were taking

medication and half were not. Measures for each child's attributions of personal causation for academic success and failure were also obtained, and the Porteus Maze test was used as a dependent variable. Self-instruction training with instructional materials and educational games improved Porteus Maze scores for subjects with high personal causality scores and for those who were unmedicated. Subjects with low perceived personal causality and those who were medicated displayed a trend toward better performance with a social-reinforcement intervention. Although subjects were initially identified by the general criterion of hyperactivity, the correlation of personal causality scores with the results suggests that other subject characteristics may be related to the effectiveness of self-verbalization strategies.

Camp, Blom, Hebert, and van Doornick (1977) used as subjects "hyperaggressive" boys identified by the School Behavior Checklist. Six weeks of training on a wide range of tasks resulted in significantly improved scores on several psychometric measures (Mazes, MFF latency, MFF Impulsivity score). However, a number of other psychometric measures failed to show a difference between subjects who received self-control training and untreated controls. Because of the extensive training period, the breadth of the training program, the lack of a direct

training control group, and the mixed results, this study provides only limited support for the efficacy of self-verbalization procedures with the subject population as defined.

Another study obtaining mixed results for a self-instruction training procedure used as subjects mentally retarded 9- to 14-year-olds (Burgio, Whitman, & Johnson, 1980). Although those students who learned self-instructional statements decreased their off-task behavior, improvement on printing and phonics tasks was not seen. However, enhanced math performance was demonstrated. The statements that the students were taught to use with math problems were more strategic in nature and task specific ("I take away 4") than the general statements taught for use with the other tasks ("What does Sr. want me to do? She wants me to draw this word"). Use of task-specific strategies as well as subject identification in terms of task-specific deficiencies may be associated with successful self-verbalization strategies.

A number of studies have used self-instruction training in an effort to increase on-task behavior in hyperactive children. Bornstein and Quevillon (1976) taught three overactive preschool boys self-instructional statements similar to those used by Meichenbaum and Goodman (1971). The mean rate of on-task behavior for

each of the three subjects increased dramatically and was maintained at a 22-week follow-up. Accuracy or quality of work produced was not measured.

Several partial and one complete replication of the preceding study have failed to obtain positive results. Billings and Wasik's (1985) direct replication of Bornstein and Quevillon did not produce any major lasting changes in classroom behavior. Although there was an increase in attending behavior following the treatment phase for each of the three children, gains were not maintained at a 2-week follow-up.

Elementary school-age, hyperactive children served as subjects in a study exploring the effects of self-verbalization on arithmetic computations and motor activity (Burns, 1972). Results did not support the prediction that self-directed commands would decrease activity level and differentially increase computation scores. All groups including a practice control demonstrated improvements in computation scores, and there was no change in activity level.

Two other studies that attempted to increase on-task behavior in hyperactive students through self-instruction training also reported negative results (Friedling & O'Leary, 1979; Shepp & Jensen, 1983). Friedling and O'Leary found that two second- and two third-graders trained in self-instructions similar to those used by

Meichenbaum and Goodman (1971) did not increase their on-task behavior or accuracy. Likewise, Shepp and Jensen failed to increase on-task behavior after teaching general self-instructions to a hyperactive seven-year-old boy.

Results from the preceding five studies suggest that self-instruction training was not an effective procedure for increasing on-task behavior in hyperactive children. Other studies discussed thus far have achieved some positive and mixed results in an effort to modify behaviors of subjects whose deficiencies were defined in a general way as hyperactive, impulsive, or aggressive. However, results from such studies do not provide clear support for effectiveness of self-instruction with these types of subjects. In some cases direct training control groups were not included (Camp et al., 1977; Palkes et al., 1968; Palkes et al., 1971). In another study self-recording and self-reinforcement were used in addition to self-instruction (Cameron & Robinson, 1980). In other studies mixed results were obtained (Burgio et al., 1980; Camp et al., 1977). There is some indication that use of task-specific strategy statements and identification of subjects in terms of task-specific deficiencies may be associated with a more successful self-verbalization training procedure (Burgio et al., 1980). The studies discussed in the conclusion of this section will be the

remainder of those that have defined their subject population in general behavioral terms, usually as hyperactive, distractible, or non-self-controlled.

A series of studies by Kendall and associates used a methodology that combined self-instruction training and response cost (Kendall & Braswell, 1982; Kendall & Wilcox, 1980; Kendall & Zupan, 1981). Although experimental treatments differed among these studies, they had the following features in common: (1) Subjects were identified in general behavioral terms as non-self-controlled problem children between the ages of eight and eleven or twelve years old; (2) The cognitive behavioral treatments used in each study included both self-instruction training and a response cost procedure; (3) Therapy materials included a range of psychoeducational tasks and game-like situations for teaching interpersonal skills; (4) The MFF was used as one of the dependent variables. In all of the Kendall et al. studies, subjects not receiving self-instruction training (i.e., behavioral treatment, nonspecific treatment) and control groups showed as much improvement on the MFF as subjects trained in self-instruction.

Varni and Henker (1979) worked with three children who had been diagnosed hyperactive. Using as dependent variables accuracy and completion of classroom reading and math, children were trained to use self-instructions

on three rather different training tasks: Porteus Mazes, Matching Familiar Figures, the Sullivan programmed reading text. Children were trained to use self-instructions during the first three sessions and subsequently learned self-monitoring. Self-reinforcement was then added in a multiple baseline design. Results indicated that self-instruction training did not improve performance over baseline. Self-monitoring had a minor effect, while self-reinforcement produced more significant effects. One explanation for the lack of effects obtained with self-instruction is the expectation that the training generalize to tasks somewhat different from the training tasks. Successful self-instruction training may require training on the target task.

Two studies discussed previously used as subjects impulsive first graders (Roberts & Mullis, 1980) and impulsive second, third, and fourth grade children (Reid & Borkowski, 1987). Both studies found that modeling or direct training was as effective as self-instruction training.

An examination of all the studies employing self-verbalization strategies with impulsive, hyperactive children provides at best qualified support for the differential effects of the procedure. Impulsive, hyperactive children are a heterogeneous population and may benefit from interventions other than or in addition

to self-verbalization strategies. Such interventions could include response cost (Kendall & Braswell, 1982; Kendall & Zupan, 1981), operant techniques (Arnold & Forehand, 1978; Shepp & Jensen, 1983), or attribution training (Reid & Borkowski, 1987).

There are some indications in the literature that when self-verbalization is effective over other procedures, learners have been identified as lacking knowledge of a specific strategy or procedure (Burgio et al., 1980; Meichenbaum & Goodman, 1971). Studies discussed in the next section will be those which have defined the subject population in terms of performance on some criterion task.

Specific definitions of learner competency. As mentioned earlier, many of the first studies of self-verbalization strategies were concerned with the efficacy of the procedure for helping impulsive children respond more reflectively. Not all such studies defined their subject population in global terms such as psychiatric diagnosis or teacher checklists. Arnold and Forehand (1978) identified preschoolers as impulsive based on their scores on the KRISP, a match-to-sample task similar to the MFF. Using mazes and design copy tasks for training, they found equal improvement in subjects given self-instruction training, self-instruction with response cost, response cost alone, and no training.

Glenwick and Barocas (1979) administered the MFF to fifth and sixth graders. After training with a broad variety of materials with varying instructors (parents, teachers, experimenter), subjects in all groups improved equally on the MFF. Differential effectiveness of self-instruction training was observed for some other measures, although results were mixed. Training procedures in this study were very general and not well defined. Parents and teachers who served as instructors chose their own materials, and there was little correspondence between training tasks and target tasks. As noted earlier, negative results sometimes occur when training materials differ significantly from the target task (Arnold & Forehand, 1978; Varni & Henker, 1979). Results from other studies have suggested that specificity of training is one factor in a successful self-verbalization procedure (Davis & Hajecek, 1985; Schunk, 1982; Schunk & Cox, 1986).

Researchers obtaining positive results for self-instruction training have also defined their population in terms of initial performance on the MFF and have used training materials other than the target task (Bender, 1976; Douglas, Parry, Marton, & Garson, 1976; Kendall & Finch, 1978). What these researchers have in common is a training procedure that focuses on visual discrimination activities that are very closely related to the

strategies required for successful performance on the MFF. Bender taught subjects to discriminate letters and pictures. Kendall and Finch trained subjects in several different tasks including finding the one that does not belong, finding pictures that match, and identifying same and different. Douglas et al. emphasized scanning stimuli for similarities and differences and "how to sort, arrange, and classify stimuli possessing particular features (p. 394)."

Meichenbaum and Goodman (1971) found that they obtained significant improvements in MFF performance after altering their procedure in Study II so that the training materials elicited task abilities similar to the MFF test. As noted earlier, Study I failed to improve subjects' error rates.

Kendall and Finch (1976) identified a single subject as impulsive based on MFF performance and observation of behavior. Five hours of self-instruction training with mazes and other games as well as response cost resulted in significantly improved MFF performance. This study differs from the pattern presented by the others in that the training task did not require strategies as closely related to the target task. However, the amount and intensity of the training as well as the response cost procedure may have been important factors in the apparent generalization of strategies. To summarize, studies

using the MFF or MFF-like tasks to identify deficient subjects have tended to indicate positive results for self-instruction training when materials and training were directed to skills needed for solution of MFF tasks.

Many studies of self-instruction training and other self-verbalization strategies have focused on improvement of academic skills. Such studies have typically defined the subject population in terms of a lack or deficiency in the target skill. The largest number of studies has been in the area of math skills.

A study by Grimm, Bijou, and Parsons (1973) focused on the teaching of number concept tasks to handicapped subjects, one autistic and one hyperactive boy. Both subjects were performing number concept tasks at a 50% level of accuracy. The procedure used in this study was not intended as test of self-verbalization training, but rather, was based on an operant problem-solving model. The procedure did, however, require subjects to verbalize aloud their counting responses. Accuracy for both subjects after training ranged from 80-90%. The authors provided a strict operant explanation for their results. Training was felt to be successful because the counting aloud behavior made overt a part of the response chain which had previously been covert. This permitted mediating responses to be monitored and reinforced.

The explanation given by the authors does not

account for the success of a self-verbalization strategy in the absence of an external reinforcer. A more cognitive explanation for the efficacy of self-verbalization strategies is provided by Roberts (1979). A naturalistic study of first graders' private speech while solving a reading task found that the primary form of speech was reading aloud. Roberts suggests that reading aloud while doing the tasks helps the child link present problem-solving behavior to previously learned responses. The counting aloud behavior performed by the subjects in the Grimm et al. (1973) study seems to have served a similar function.

Spates and Kanfer (1977) explored the efficacy of different self-verbalizations during math problem-solving. First graders who did not pass a minimum arithmetic requirement were taught addition skills under one of five different conditions. The treatment condition which resulted in significant improvements in accuracy was the one the authors termed "criterion-setting." Subjects in this group were trained to say aloud, "First I should add the two numbers on the right; then I should add the two numbers in the middle; next I should add the two numbers on the left." Subjects in other treatment groups in this study were provided with either less or more procedural information. An example of less procedural information would be the

verbalization, "Now I am adding these two numbers here." Those groups required to self-verbalize more procedural information either repeated the numbers being added or made self-evaluative statements such as, "I am right." These statements were made in addition to the above-mentioned "criterion-setting." The addition of the extra self-verbalized statements did not preclude improvements in performance; however, they appear not to have been needed.

Traditional self-instruction training has been used to teach math skills to mentally retarded children. Johnston, Whitman, and Johnson (1980) ascertained through teacher recommendation and prebaseline measures that three children in the EMR-Borderline range of intelligence could not solve arithmetic problems requiring regrouping. Following the procedures outlined by Meichenbaum and Goodman (1971) the children were taught a set of self-instructions incorporating component processes needed for successful solution of addition and subtraction algorithms. All three children in this multiple baseline study demonstrated significant increases in accuracy on addition and subtraction problems requiring regrouping. Similar results were obtained in another study by Whitman and Johnston (1983) in which a like population of nine children were again taught self-instructions to aid acquisition of addition

and subtraction skills. This study differed from the former one in that tape recordings were made of each child after he or she was able to independently solve math problems using the self-instructions. Results indicated that all nine children showed a significant increase in accuracy of math problem-solving. Ratings of the audio tapes made after the training indicated that the amount of self-instruction displayed by the children varied considerably.

Davis and Hajicek (1985) taught multiplication skills to severely behaviorally disordered students. Selection criteria for the study were a mathematics grade level between 3.0 and 5.0 and 20% or less accuracy when presented with ten multiplication problems involving decimal fractions. Students initially received training from a model whose verbalizations included the procedures for solving decimal multiplication problems as well as the content components suggested by Meichenbaum and Goodman (1971). In the second phase of this multiple baseline study, students were given instructions to talk to themselves while working. This procedure differed from that used in most self-instruction studies. The students' self-verbalizations were not constrained; rather, they were given general instructions such as, "You know, sometimes when we're solving problems like these, we tell ourselves what to do....We tell ourselves

how to multiply the numbers..." (p. 278). As mentioned earlier, strategy training led to improved accuracy, and self-instruction training resulted in greater improvements.

Very few studies of self-instruction training have followed a procedure in which subjects constructed their own verbalizations. In two such studies (Schunk, 1982; Schunk & Cox, 1986) subjects were given training in either long division or subtraction skill by a model who verbalized strategies. They were then instructed to think aloud while working. As with all the studies discussed in this section, the population was defined in terms of a clear-cut academic deficiency, inability to solve long division problems (Schunk, 1982) or inability to do subtraction with regrouping (Schunk& Cox, 1986). In both cases self-verbalizaion improved math problem-solving.

Malamuth (1979) defined his subject population as fifth grade poor readers. Subjects were identified by reading levels two years below grade level and two pretests, a reading test and an audiovisual checking task. As mentioned earlier, subjects in the self-instruction training group performed better than the modeling control group.

Swanson and Scarpati (1984) used self-instruction training to improve reading and spelling scores for two

boys, an eighth and a ninth grader, who had reading and spelling scores at least four years below grade level. Training involved two types of strategy statements: general strategy statements which served to slow down the problem-solving process and task specific strategies which focused on identifying what the child could do to ascertain the appropriate knowledge. Both subjects showed improvement in reading comprehension scores. In a second experiment self-instruction training was taught to an emotionally disturbed 13 year-old boy who not yet learned two and three digit addition with regrouping. Training was similar to that in Experiment 1 and the percentage of problems worked correctly increased significantly. Generalization of training was observed in another setting.

In another study by Swanson (1985) a thirteen girl was selected as the subject because of reading and spelling performance below the 15% level on the Peabody Individual Achievement Test. The subject was also hearing impaired and had behavioral difficulties. Reading and spelling assignments were used as the training materials. The student's teacher used signing and verbalizations to model task specific and general skills statements. The teacher then directed the subject to produce at least one nonverbal referent, i.e., underlining words in the story, that matched each self-

instructional statement. Reading comprehension and spelling scores improved significantly. In a second experiment three emotionally disturbed children were selected because of low academic performance in spelling and math. All had adequate speech. Following a procedure similar to that described previously, all subjects demonstrated significant increases in percentage of correct math and spelling responses. Generalization to similar math and spelling tasks was observed. These studies, as well as others discussed in this section, indicate the effectiveness of self-instruction training for a variety of subjects. What the studies have in commmon is a clear definition of the subjects' academic deficits and a training procedure that is targeted on those deficiencies.

There is one study discussed previously that obtained mixed results (Thackwray et al., 1985). The lack of consistent positive results may be partially explained by the procedure through which subjects were selected. Subjects were not screened by academic performance, but rather through two rating scales, a global behavior rating scale and an academic skills rating scale devised by the authors. The training tasks consisted of two, three, and four place addition problems. The dependent variables were a math quiz, the Peabody Individual Achievement Test, and an academic

skill rating scale devised by the authors. Not only did the authors fail to use a task specific procedure for subject selection, but the degree of correspondence between the dependent variables and the training tasks was unclear.

Bryant and Budd (1982) taught self-instructions to three preschoolers who were identified as having poor independent work skills based on teacher recommendation, performance on a problem-solving subtest of the CIRCUS (a kindergarten readiness test), and the MFF. Results indicated that all three children showed clear increases in accuracy on worksheets that were similar to those used during self-instructional training. Increased accuracy on dissimilar worksheets was less consistent.

Two studies used self-instructions to help children improve handwriting skills (Kosiewicz, Hallahan, Lloyd, and Graves, 1982; Robin, et al., 1975). In one case a nine year old boy was trained to use self-verbalizations to improve his cursive handwriting (Kosiewicz et al.). In the other case kindergarten subjects were referred by teachers because of writing deficiencies (Robin et al.). Positive results were obtained in both studies; however, training was lengthy. The authors also noted that the procedure was cumbersome and that children's use of self-instructions was not correlated with correct letter copying. Results from these two studies suggest that

self-verbalization training may not be the intervention of choice for modifying a motor task such as writing.

In conclusion, the great majority of studies of self-verbalization training that have used a specific performance based definition of learner competency have obtained positive results. Although many of these studies were multiple baseline designs and did not have control groups, there is a subset of studies that meets both criteria--inclusion of a direct training control group and a specific definition of learner competency. All of these studies obtained positive results for the differential effectiveness of self-verbalization training (Asarnow & Meichenbaum, 1979; Bender, 1976; Malamuth, 1979; Schunk, 1982; Schunk & Cox, 1986). There have been no studies, however, in which the effectiveness of self-verbalization training has been tested comparatively for more proficient and less proficient learners.

## Self-verbalization model

Vygotsky and Luria's early theories. Vygotsky (1962) was one of the first theorists to discuss how private speech may exert a controlling effect on behavior. He reported that children he observed were more inclined to talk to themselves as a task became more difficult. These utterances reflected a problem-solving orientation. Vygotsky concluded that private speech, which occurred aloud in the younger child and eventually

became covert, assisted in planning, guiding, and monitoring problem-solving activities.

Luria (1961) elaborated these ideas into a three-stage process of increasing internalization of verbal self-control. Children's behavior was said to be initially regulated by verbal instructions from others. During the next stage the child guides his/her actions via overt self-verbalization. Finally, between ages 4.5-5.5 private speech becomes capable of guiding motor behaviors.

Although Vygotsky and Luria had begun to articulate a theory of how private speech regulates behavior, subsequent research findings have not provided consistent support for their views (Bronckart, 1970; Fuson, 1979; Miller, Shelton, & Flavell, 1970; Roberts, 1979). Miller et al. attempted to replicate Luria's developmental sequence and found no age by condition interactions.

Bronckart (1970), in a review of his research and that of others, questions Luria's interpretation of the relationship between self-verbalization and motor behavior. The research in question concerns the typical Lurian bulb pressing task on which the child would control motor responding with verbalizations such as "squeeze" and "don't squeeze." Bronckart reports that in the majority of cases the task is done no more poorly in the silent than in the verbal condition. He makes the

point that one of the most important factors contributing to the success of a task is the task instruction given by the adult at the beginning and the child's comprehension. These issues were not explored by Luria.

Fuson (1979), in a review of the research on self-regulating speech, echoes the concerns of earlier authors. She concludes in her summary of results on spontaneous self-regulating speech that the amount of children's private speech appears to be very small, and that the developmental course of spontaneous self-regulating speech is unclear. Finally, she notes that conceptual frameworks and operational definitions that have been used to investigate self-regulating speech are hazy and inconsistent from study to study.

Naturalistic studies. Despite their limitations, some of the naturalistic studies shed light on the different use of private speech by proficient and less proficient learners. Studies of children's use of private speech during problem solving indicate that those who perform poorly tend to use speech which is task-irrelevant or is negative in content (Roberts, 1979; Zivin, 1972, cited in Zivin, 1979).

Roberts (1979) videotaped and recorded the private speech of first graders while they were completing a written reading assignment. An analysis of the timing and content of private speech indicated that more

competent children concentrate their task-irrelevent speech after finishing the task. Less competent children distribute task-irrelevant utterances throughout the task. Such statements occurred when the child was off-task and appeared to be a comment on the non-task behavior or a rationale for its continuation.

One obvious explanation for the task-irrelevant speech of the less competent child is that it reflects frustration. However, Roberts (1979) rejects this explanation because his data show no increase in task-irrelevant speech when the less competent child is presented with more difficult tasks. Even when IQ is held constant, children who respond correctly use less task-irrelevant speech than those who respond incorrectly. An examination of the child's motor behavior during task-irrelevant speech also argues against the frustration explanation. The task-irrelevant comments occurred more often after the child was already off-task. After veridically evaluating their work as incorrect or difficult, the children who perform poorly do not continue to problem solve. Roberts also reports that the less competent child uses more task-relevant speech than the more competent child. However, the task-relevant speech of children who do poorly on the task contains more negative evaluative statements than that of their more competent peers.

A study by Zivin (1972, cited in Fuson, 1979) provides further evidence for questioning the facilatory value of spontaneous private speech. Four year olds who did not talk while solving finger mazes were faster and more accurate than those who produced some private speech. Seventy-five percent of the utterances used were "task-irrelevant or inarticulate, reflecting an emotional reaction to errors rather than self-regulating speech" (p. 142).

The results of the above naturalistic studies are consistent with the idea that for the less proficient learner spontaneous private speech tends to be ruminative and negative in content. The literature reviewed indicates that teaching self-verbalization to such students may improve their performance. Bandura (1986) has suggested that verbal self-guidance may provide the means for replacing disruptive self-referent thought with task directed thought.

A difficulty may arise when the conceptual framework used by those who have studied private speech as it occurs naturally is applied to studies which teach self-verbalization with the intent of controlling behavior. Meichenbaum and Goodman (1979) note the importance of making a distinction between spontaneous private speech and self-verbalization which is elicited for the purpose of modifying behavior. Private speech which occurs

naturally may follow a developmental sequence in the younger child which differs from the most effective procedure for training self-verbalization in the school age child. Children in studies of spontaneous private speech are usually given a task and told to talk aloud. Usually the content of their verbalizations is coded, and inferences are made regarding content characteristics and task performance (Fuson, 1979; Roberts, 1979).

Alternatively, Meichenbaum and Goodman (1979) suggest that the best way to investigate the function of self-speech on behavior is to observe whether different kinds of pretraining experiences in self-verbalization influence task performance. Such studies typically vary the training provided by the model or contrast it with other procedures in order to examine effects on academic tasks, problem-solving, and other behaviors. A comprehensive theory of learning would provide the best conceptual framework for this type of investigation. Bandura's social cognitive theory (1986) is proposed as a framework for understanding the role of verbal self-regulation in learning.

Bandura's social cognitive theory. Bandura's social cognitive analysis of observational learning (1986) is governed by four processes: attentional processes regulate and determine what modeled activities are selectively observed; retention processes allow modeled

information to be represented symbolically in memory; production processes govern the organization of constituent subskills into new response patterns; motivation processes determine whether or not observationally acquired competencies will be put to use. For example, when learners are provided with a modeled strategy, motivation processes can be a major determinant in whether the strategy will be used.

Bandura notes that cognitive skills are usually improved more by the combined influence of a model's speech and action than by a model's action alone. By verbalizing their thought strategies aloud as they engage in problem solving, models make overt their covert thought processes. Learners may also be prompted to verbalize aloud during performance. This self-regulatory speech by the learner may improve learning by instigating the use of modeled strategies. Bandura has suggested that the use of self-verbalization during performance may enable some learners to interrupt disruptive self-referent thought and replace it with task-relevant strategies.

The importance of self-referent thought as a factor in performance is addressed by Bandura through the construct of self-efficacy (Bandura, 1977, 1978, 1986). Self-efficacy is part of the self-regulatory system. Bandura conceptualizes the self-regulatory system as

composed of cognitive structures that govern self-observation, judgments of adequacy, and self-reactions. Social cognitive theory is based on the principle of reciprocal determinism, meaning that behavior is determined by reciprocal interactions between behavior, thought, and environmental events. The self-regulatory system, therefore, operates within a larger context and individuals are viewed as partially but not completely free to control their behavior. As part of the self-regulatory system, self-efficacy is defined as "people's judgment of their capabilities to organize and execute courses of action required to attain designated types of performance (1986, p. 391)."

Self-efficacy judgments are based on four principal sources of information: performance accomplishments, vicarious experience, verbal persuasion, and physiological states. People tend to misjudge their efficacy when they are unsure of the demands of the task and/or their own capabilities. Because of their limited cognitive skills and experience children are more likely to lack the knowledge needed for accurate self-efficacy judgments. When children experience failure, they are much more likely to base future estimates of their efficacy on the immediate and most salient outcome. They are also less able to distinguish between important and minor indicants of their efficacy. Self-verbalization is

one treatment that can be used to influence the information that children obtain during performance.

As noted in the naturalistic studies of children's private speech, those who performed less well reacted with negative self-evaluative statements. Self-speech of this variety would tend to hinder effective use of the competencies which the child may indeed possess by diverting attention from use of task-relevant strategies. These difficulties combined with developmental limitations should result in lower and less accurate efficacy judgments. Such children should be aided by coping strategies which interrupt self-evaluative ruminations and replace them with task relevant thought.

Kuhl's state versus action orientation. A further clarification of the role of self-referent thought during problem-solving is provided in Kuhl's theory of motivation and action control (Kuhl, 1981; Kuhl, 1984). Kuhl suggests that people may have an intention to perform a task but be unable to shield that intention against competing action tendencies. For example, a child may have a strong intention to solve a problem but fail to do so because of a tendency to become distracted by task-irrelevant thoughts such as doubts about his/her self-esteem.

Kuhl suggests that two different kinds of cognitive activities come into play once an intention to act has

been formed. Cognitive activities focussing on action alternatives and plans are termed an action orientation. An action orientation facilitates performance. Cognitions that focus on one's present, past, or future state are termed a state orientation. Examples of a state orientation would be examining the causes for not reaching a goal and focusing on one's present emotional state. Kuhl describes these responses to an aversive event as a "contemplating or freezing reaction (1984, p. 115)." A state orientation tends to debilitate performance.

Experiments by Kuhl (1981) found that subjects who had experienced failure tended to report greater importance of good performance and greater effort on a subsequent task. Nevertheless, these subjects tended to ruminate on task-irrelevant cognitions and performed less well despite the high initial motivation. In another experiment subjects whose responses to a questionaire suggested a state orientation performed less well, although they, too, reported high motivation. The performance of such subjects improved when they were instructed to state their hypotheses explicitly during problem-solving. Kuhl suggests that by fostering an action orientation this intervention prevented the subjects from becoming functionally helpless.

Kuhl's definition of a state orientation describes

behavior (e.g., focussing on one's present emotional state) that is consistent with that observed by Roberts (1979) and Zivin (1979). Subjects who performed poorly made more negative, self-evaluative verbalizations than those who performed well. Kuhl's effective intervention of having the less competent subjects state their problem-solving hypotheses while working is similar to procedures in which subjects were instructed to verbalize task strategies. Kuhl's results are consistent with Bandura's suggestion that constructive self-verbalization may facilitate performance by interrupting debilitating self-referent thought.

Specific knowledge. Many studies have shown that domain-specific knowledge is more useful for problem-solving than are general strategies. A study by deGroot (cited in Bransford, Sherwood, Vye, & Rieser, 1986) showed that chess masters were no better than less experienced players at remembering the random placement of chess pieces, but were superior at remembering the placement of chess pieces from an actual game. The advantage that the chess masters had was a domain-specific knowledge base which allowed them to see meaning in a chess game but not in randomly placed pieces. The main thrust of this and a number of other studies reported by Bransford et al. is that specific knowledge in a domain is acquired hand in hand with the ability to

organize and perform logical operations on that knowledge.

These results are consistent with the studies reviewed which show that self-verbalization procedures are effective when they provide the subject with guidance in using task specific strategies. Schunk and Gunn (1986) showed through path analysis that the largest direct influence on changes in division skill was due to effective task strategies. Children's use of strategies was determined by having them verbalize aloud.

The type of deficiency targeted by the self-verbalization procedure is also an important factor. Although many early studies of self-verbalization were directed toward modifying general performance behaviors such as impulsivity, recent studies (Davis & Hajacek, 1985; Schunk, 1986; Whitman & Jpohnston, 1983) show that verbal self-regulation may be more successful when used by subjects who demonstrate a deficiency in applying task-specific strategies.

Proposed study

A review of the existing research indicates that questions remain regarding the effectiveness of self-verbalization procedures compared to direct instruction and modeling. Scrutiny of these studies suggests that self-verbalization may be more effective for learners who lack proficiency on a criterion task, provided they

verbalize task-specific strategies. The present study examined the effectiveness of self-verbalization of task strategies for learners of different proficiency levels. It was expected that verbalization of task strategies would be differentially effective for less proficient learners compared to more proficient learners. Less proficient learners were expected to perform better when they are instructed to verbalize task strategies. More proficient learners were expected to perform as well silently as with self-verbalization.

The study was also a test of Kuhl's view that verbalization of strategies fosters an action orientation. Studies have indicated that less proficient learners may tend to focus on negative self-evaluations rather than action-oriented plans when presented with an aversive situation. Bandura (1986) has suggested that self-verbalization may provide a means for interrupting these irrelevant ruminations and replacing them with task relevant strategies.

Students' level of proficiency was determined on a pretest. Less proficient students were defined operationally as those who could not solve the task at all, and more proficient students were those who achieved a solution but made at least three errors. Because neither group of students demonstrated mastery of the task, both were expected to benefit from observing a

model perform the task while verbalizing strategies. Verbal and visual modeling were provided via a videotaped model. Training in self-verbalization of strategies was expected to improve the performance and self-efficacy of less proficient students who were assumed less likely to use strategies without explicit prompting. Follow-up testing was done to determine whether the benefits of hearing and verbalizing strategies were retained. One study has shown that the advantages of rehearsing modeled responses in familiar memory codes were greater at follow-up than in initial testing (Bandura & Jeffrey, 1973).

The dependent measures were a maze test similar to the most difficult item on the Mazes subtest of the WISC-R, a self-efficacy scale, and a cognitive orientation measure. Although most children are familiar with mazes and the basic procedure for completing them, pilot data indicated that many six- and seven-year-olds fail to use effective strategies for solving mazes of this level of difficulty. Preliminary results indicated that instructions to self-verbalize strategies resulted in greater use of task relevant strategies.

Hypotheses

Based on Kuhl's (1984) proposition that failure experiences are associated with a state orientation, Hypothesis 1 was advanced regarding less proficient

learners' performance on the action control questionaire.

1. Less proficient learners will have higher state orientation scores on the action control questionaire than will more proficient learners.

Hypothesis 2 was advanced as a test of Bandura's (1986) principle that success raises self-efficacy appraisals.

2. There will be a positive correlation between pretest self-efficacy scores and pretest maze performance scores for all subjects.

The following group of hypotheses focuses on the effects of strategy modeling on less proficient learners' maze performance.

3. Less proficient learners who hear the model verbalize strategies during training will achieve significantly higher maze performance scores at posttest than less proficient learners who observe a silent model.

4. Less proficient learners who hear the model verbalize strategies and are instructed to verbalize strategies will achieve higher maze performance scores at posttest than less proficient learners who hear the model and are instructed to work silently.

5. Less proficient students who hear the model verbalize strategies and who themselves verbalize strategies during training will have higher maze performance scores at follow-up than less proficient

students who observed the model verbalize but did not themselves verbalize strategies.

The following group of hypotheses focuses on the effects of strategy modeling on less proficient learners' self-efficacy.

6. Less proficient learners who hear the model verbalize strategies during training will achieve significantly higher self-efficacy scores at posttest than less proficient learners who observe a silent model.

7. Less proficient learners who hear the model verbalize strategies and are instructed to verbalize strategies will have higher self-efficacy scores at posttest than less proficient learners who hear the model and are instructed to work silently.

8. Less proficient learners who hear the model verbalize strategies and who themselves verbalized strategies during training will have higher self-efficacy scores at follow-up than less proficient learners who observed the model but did not themselves verbalize strategies.

The following group of hypotheses focuses on the effects of strategy modeling on proficient learners' maze performance.

9. Proficient learners who observe the silent model during training will achieve significantly higher maze performance scores at posttest than those in the control

group who do not observe the model.

10. Proficient learners who hear the model verbalize strategies during training will achieve significantly higher maze performance scores at posttest than proficient learners who observe a silent model.

11. Proficient students who hear the model verbalize strategies will have higher maze performance scores at follow-up than proficient students who observed a silent model.

The following group of hypotheses focuses on the effects of strategy modeling on proficient learners'self-efficacy.

12. Proficient learners who observe the silent model during training will achieve significantly higher self-efficacy scores at posttest than those in the control group who do not observe the model.

13. Proficient learners who hear the model verbalize strategies during training will achieve significantly higher self-efficacy scores at posttest than proficient learners who observe a silent model.

14. Proficient learners who hear the model verbalize strategies will have higher self-efficacy scores at follow-up than proficient learners who observed a silent model.

# Chapter Three

## Method

### Subjects

One hundred first, second, and third grade students were originally tested. Some subjects failed to comply with instructions to verbalize. When these subjects were dropped from the original pool, a sample of 89 subjects was created. The proficient group was comprised of 24 boys and 22 girls. The less proficient group was comprised of 13 boys and 30 girls. Most of the subjects attended an elementary school in a suburb of primarily middle to upper middle class socioeconomic status. Several subjects were from neighboring communities and were attending a summer camp program when they participated. Subjects' ages ranged from 6-1 to 9-5. The mean age of the subjects was 7-1.

### Subject Selection

As noted above, students who were unresponsive to self-verbalization training were omitted from further analysis. The following criterion was established for the modeling with strategy verbalization and self-verbalization condition: The subject verbalized something strategic that amounted to ten words or more. For the modeling without strategy verbalization and self-verbalization condition the following criterion was established: The subject verbalized ten words or more.

There was no restriction on content for this condition.

Applying this criterion to the less proficient learners in the modeling without strategy verbalization condition and self-verbalization condition resulted in two subjects being dropped. One of these subjects was a boy who subvocalized unintelligibly and made some noises but said no recognizable words. The other subject dropped from this condition was a boy who verbalized eight words and also made a few subvocalizations and sounds, such as "hmmm."

When the criterion was applied to less proficient learners in the modeling with strategy verbalization and self-verbalization condition, five subjects had to be dropped. One subject verbalized a great deal, but the content of his verbalizations was negative and non-strategic. One girl was dropped because her only verbalizations consisted of two negative statements comprising nine words. Another girl did not meet the criterion because she did not verbalize at all. The fourth subject dropped, a boy, made a few neutral statements but said nothing strategic. The fifth subject dropped was a girl who made one irrelevant statement.

When the criterion was applied to proficient subjects in the modeling without strategy verbalization and self-verbalization condition, one boy was dropped because he verbalized only nine words. In the modeling

with strategy verbalization and self-verbalization condition three subjects were dropped. One girl did not verbalize at all, and another girl verbalized six intelligible words in addition to unintelligible subvocalizations. One boy was dropped because he verbalized nine words which were nonstrategic in nature.

Materials

Mazes performance. Three parallel forms of a mazes test were developed. The mazes were similar in format to the Mazes subtest of the WISC-R. Several less complex mazes were taken from the WISC-R and used as demonstration and practice mazes. The most difficult maze on the WISC-R was used as the follow-up maze. The pre- and posttest mazes were designed to be equal in difficulty to this maze based on number of choice points and maximum length of blind alleys.

Proficiency measure. Subjects' competency was determined by performance on a pretest maze. Subjects solving the pretest maze with two or fewer errors were excused from further participation. Those achieving solution with three or more errors were classified proficient learners. Those not achieving a solution during the 240 second time limit were classified less proficient learners.

Self-verbalization. Subjects' spontaneous verbalizations were tape recorded while they were working

on the pretest maze. A recording of spontaneous self-verbalizations was also made while the child was working on the test maze.

Self-efficacy measure. Self-efficacy ratings were made using a procedure similar to that used by Schunk (1982). The efficacy scale ranged from 10 to 100 in 10 unit intervals. Four points on the scale were labeled as follows: Not Sure at 10; Maybe at 40; Pretty Sure at 70; and Real Sure at 100. Children were given practice with the scale by judging their certainty of jumping progressively longer distances. This concrete experience enabled them to understand the use of the numerical values to convey the strength of their perceived efficacy.

Cognitive orientation measure. Subjects' disposition to respond with a state or action orientation was assessed with a 13 item questionaire similar to that used by Kuhl (1985) to measure action control (see appendix A). Items were parallel in content with only a slight rewording to make them meaningful to children. Kuhl used a 20 item questionaire with adult subjects in order to establish their disposition to respond with a state or action orientation following unpleasant experiences. Each item described an unpleasant hypothetical situation. State oriented responses were designed to reflect one of three possible types of

cognitive activities: (1) Comparing an outcome of one's action with a standard; (2) Examining the causes for not having reached a goal; (3) Focusing on the present emotional state. A sample item had the stem: "When something important to me just keeps going wrong..." The state oriented response would be , "I gradually get discouraged." The action oriented resonse would be, "I forget about it for a while and do something else."

Modeling videotape. The modeling videotape displayed a fifteen year old girl solving a maze of moderate difficulty. The videotape model illustrated two strategies, looking ahead before moving her pencil and going back to the choice point and trying another path after entering a blind alley. The model traced the path with her finger and then drew it with the pencil. The model's action was accompanied by the following verbalizations:

> First I go along the path with my finger and find the next doorway. Then I draw it in with the pencil. I'm looking for the next doorway. Then I draw it in with the pencil. I'm going along the path with my finger. This is a dead end, so I don't go that way....

The verbalized strategy was repeated eleven times until the model completed the maze. The tape was 2 1/2 minutes in length.

Procedure

Each child was taken from the classroom and tested

individually in a quiet room. This procedure was followed for pretest, posttest, and follow-up.

Pretest. The experimenter demonstrated a sample maze for each child. The child then solved two mazes of increasing difficulty before proceeding to the pretest maze. Instructions for the sample maze were as follows:

> Watch me do this maze. I start here in the middle and I draw the path to get out. I can't go through a wall, and I want to stay out of dead ends.

Basic instructions for the practice and pretest mazes were as follows:

> Now I would like you to solve this maze. Start in the middle and find your way out. While you are working, I would like you to talk aloud about what you're thinking.

If the child stopped trying, the experimenter said, "Don't stop. Keep going until you find your way out." If the child went into a blind alley and stopped, the experimenter said, "It's O.K. if you make a mistake. Just continue finding the way out." If the child kept looking through the maze without beginning, the experimenter said, "Just begin here and draw the path to get out." If the child failed to speak aloud while working, the experimenter said, "Don't forget to talk aloud while you're working."

Interview. Immediately following maze performance each child was asked the question, "What did you think

about while working on the maze?" Each child was also administered the questionaire in order to determine whether he or she had a disposition toward a state or an action orientation. Subjects were then shown a maze similar to the one they had just worked on and asked to judge their certainty of being able to solve it. Each subject's maze was scored and the subject's classification of proficient of less proficient determined.

Design. The experimental design is a 2 X 2 X 2 (model verbalization vs. no model verbalization X subject verbalization vs. no subject verbalization X proficient learner vs. less proficient learner) crossed factorial. After the subject was designated either a proficient or less proficient learner, he or she was randomly assigned to one of five treatment groups: 1. modeling with strategy verbalization and self-verbalization, 2. modeling with strategy verbalization and no self-verbalization, 3. modeling without strategy verbalization and with self-verbalization, 4. modeling without strategy verbalization and no self-verbalization, 5. no modeling control group.

| Less Proficient | | Proficient | |
|---|---|---|---|
| model verb. self-verb. | model verb. no self-verb. | model verb. self-verb. | model verb. no self-verb. |
| silent model self-verb. | silent model no self-verb. | silent model self-verb. | silent model no self-verb |
| practice control | | practice control | |

Treatment Conditions. Subjects in Group 1, the modeling with strategy verbalization and self-verbalization viewed the videotape of the model solving a maze accompanied by the verbal monologue. After viewing the videotape they were individually administered a parallel maze and instructed as follows:

> I want you to work on this maze and tell yourself about it aloud the way you saw it on the TV. Just say aloud what you're thinking about.

If subjects did not speak while working on the maze or failed to verbalize the appropriate startegy, they were questioned as follows, "What did the girl on the TV say while solving the maze?" If they could not answer correctly, the basic strategy was repeated, "I have to find the next doorway. I look ahead first and then draw the path with my pencil."

Subjects in Group 2, the modeling with strategy verbalization and no self-verbalization condition also viewed the videotape of the model with the verbal

accompaniment. They were administered a parallel maze and instructed as follows:

> I want you to work on this maze. Work silently and don't talk aloud.

If subjects spoke while working on the maze, they were reminded to work silently.

Subjects in Group 3, the modeling without strategy verbalization and with self-verbalization viewed the videotape of the model solving the maze with the volume turned off. They were then presented with a parallel maze and instructed as follows:

> I want you to work on this maze and tell yourself about it the way you saw it on the TV. Just say aloud what you're thinking about.

If subjects did not speak while working on the maze, the instructions were repeated: "Just say aloud what you're thinking about. Tell yourself about it the way you saw it on the TV."

Subjects in Group 4, the modeling without strategy verbalization and no self-verbalization condition viewed the videotape of the model solving the maze with the volume turned off. They were then presented with a parallel maze and instructed as follows:

> I want you to work on this maze. Work silently and don't talk aloud.

If subjects spoke while working on the maze, they were reminded to work silently.

Subjects in the no modeling control group did not

view the videotape of the model. They were presented with the same prallel maze as all other subjects and instructed as follows: "I want you to work on this maze. Start in the middle and find the way out."

Test phase. When the test maze was presented, all subjects were given the basic instructions again depending on treatment condition. If they failed to follow instructions, the basic instructions were repeated, but no corrections were made. After completion of the test maze, subjects' efficacy judgments for a similar maze were again solicited.

Follow-up. All subjects were tested one week after training on a parallel maze. They were given no special instructions other than the basic instructions. They were not told to talk aloud.

After completing the follow-up maze, all subjects were asked the question, "What did you do to help yourself solve the maze?" Subjects in the groups that observed the silent model also were asked, "What did the girl on the TV do to help herself solve the maze?" Subjects who had seen the verbalizing model were asked, "What did the girl on the TV say and do to help herself solve the maze?"

Scoring Procedure

The basic instructions given all subjects directed them to "draw the path to get out" and to "stay out of

dead ends." The model demonstrated a strategy in which she identified blind alleys and avoided them. Both accuracy and the ability to find the correct path through the maze were considered components of the subject's ability to implement a strategy.

Mazes were scored according to the subject's average rate of success per choice point in the maze. The score consisted of the sum of the ratios of correct to total (correct + incorrect) gates entered at each of the 10 or 11 gates necessary for solution. If a subject failed to complete the maze, the ratio entered for those gates not reached would be zero. In this way the score reflected both the subject's degree of accuracy on those parts of the maze that were completed and the degree of completion. The score then had to be converted to an average since the pretest maze had 10 gates, and the posttest and follow-up mazes had 11 gates. A perfect solution would receive a score of one, with possible scores ranging from zero to one. The following formula was used to compute all scores.

$$\text{score} = 1/n \sum_{i=1}^{n} \frac{\text{number of successes at gate } i}{\max(1, \text{number of tries at gate } i)}$$

where $n$ = number of gates on "successful" path through maze

$1/n$ = normalization factor - normalizes for different values of n on different mazes

max (1, # tries at gate $_i$) avoids division by zero

The following example illustrates the computation of a score on the pretest maze for a less proficient subject who could not complete the maze and who also entered a number of blind alleys. She entered three incorrect gates before passing the first gate, a ratio of 1/4. Before finding the second gate she entered four incorrect gates, a ratio of 1/5. Gate three was passed with no missteps, a ratio of 1/1. Gates four and five were also passed through with no entries into incorrect gates, also yielding ratios of 1/1 each. Gates six through ten were never reached, so they are entered as 0/1. The sum of the ratios is 1/4 + 1/5 + 1/1 + 1/1 + 1/1 + 0/1 + 0/1 + 0/1 + 0/1 + 0/1 = 3.45. To normalize or get an average accuracy score, the summation term is divided by 10, the number of gates on the successful path through the maze. The score is .34.

Dependent Measures

Subjects' maze performance was scored as described above.

The measure of strength of self-efficacy was obtained from the self-efficacy scale.

The measure of state or action orientation was obtained from the 13 item questionaire.

# Chapter Four

## Results

Maze performance scores and self-efficacy judgments were analyzed with one-way analyses of variance. Hypotheses were tested with preplanned comparisons using the *t* statistic. Post hoc tests were done using the Tukey-HSD procedure.

### Cognitive Orientation Measure

Subjects' tendency toward a state orientation was measured with the Cognitive Orientation Scale. Hypothesis 1 predicted that less proficient learners would achieve scores indicative of a higher level of state orientation than more proficient learners. Proficient learners achieved a mean score of 3.5 (SD = 1.96). Less proficient learners achieved a mean score of 3.1 (SD = 1.68). A t-test comparing all proficient and less proficient learners in the original data set on the Cognitive Orientation Scale was not significant, $t(90) = .795$. Cronbach's alpha coefficient of reliability was .50. When item-total correlations were computed, it was found that items 3 and 13 had negative correlations with the total, and item 2 had a very small correlation (.09). With these items deleted, Cronbach's alpha rose to .62. Kuhl (1985) reports obtaining an alpha of .79 on a scale of 20 items using adults as subjects.

Self-efficacy and Performance

Hypothesis 2, which predicted that pretest self-efficacy and maze performance scores would be positively correlated, was confirmed. At pretest the Pearson correlation between maze performance and self-efficacy for proficient and less proficient learners combined was $r = .36$, $p<.001$. At posttest the correlation between self-efficacy and performance for all subjects was $r = .17$, $p<.06$, and at follow-up the correlation between self-efficacy and performance for all subjects was $r = .36$, $p<.001$.

Less Proficient Learners

Maze performance. Means and standard deviations for maze performance for less proficient learners are presented by treatment condition in Table 1. There was no difference at posttest between less proficient learners who heard the model verbalize strategies during training and those who observed a silent model (Hypothesis 3). There was also no difference at posttest between less proficient learners who heard the model and verbalized strategies compared to those who heard the model but were instructed to work silently (Hypothesis 4). Hypothesis 5 was confirmed: At follow-up less proficient subjects who had heard the model and then verbalized during training and posttest had higher maze performance scores than those who had merely heard the

model but worked silently, $t(13) = -1.73$, $p<.05$. Figure 1 displays maze performance scores for less proficient learners.

Table 1

Less Proficient Learners
Means and SD as a Function of Experimental Treatment

| | Silent model | | | | | | Verbalizing model | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Control | | Silent | | Self-verb[a] | | Silent | | Self-verb[b] | |
| Measure | M | SD | M | SD | M | SD | M | SD | M | SD |
| Maze Performance | | | | | | | | | | |
| Pretest | .17 | .16 | .20 | .27 | .16 | .20 | .17 | .22 | .14 | .27 |
| Posttest | .39 | .41 | .48 | .38 | .55 | .38 | .64 | .37 | .54 | .35 |
| Follow-up | .49 | .37 | .59 | .37 | .59 | .31 | .58 | .38 | .91 | .11 |

Note. $n = 10$ except as noted. [a] $n = 8$. [b] $n = 5$.

Verbalization and performance. In order to determine whether verbalization of task strategies was associated with maze performance, the verbalizations of subjects in the modeling with strategy verbalization and self-verbalization condition were scored for the presence of task strategies. A Pearson correlation between strategy verbalization at posttest and maze performance at follow-up was done using all ten subjects in this condition from

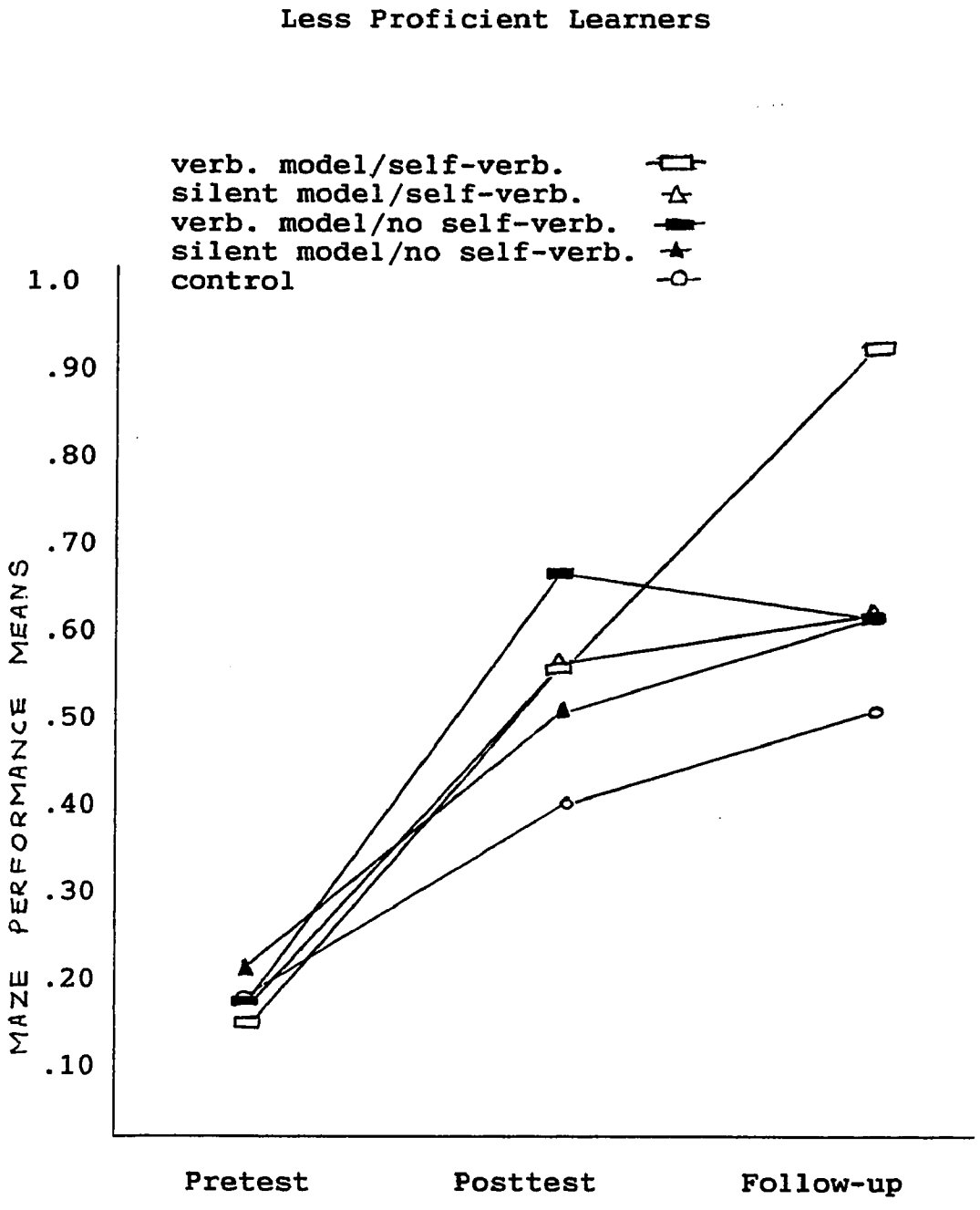



Figure 1. Maze performance means for less proficient learners at pretest, posttest, and follow-up.

the original data set. The correlation was positive and significant, $r$ = .60, $p<.04$.

After completing the follow-up maze, subjects were asked what they had done to help themselves solve the maze and, when applicable, what the girl on the TV had done to help herself solve the maze. Students who had heard the model were also asked what the girl had said. All of the five subjects who complied with the self-verbalization treatment at posttest were also able to repeat it in some form at follow-up. In the original data set there were five other students who were not included in the analysis because they did not comply with the self-verbalization instructions at posttest. Four of these five students were also able when questioned to express the strategy that the model used. However, two of them failed to solve any of the mazes presented. These informal data suggest that self-verbalization of the strategy induced strategic behavior more consistently than just hearing and remembering the model's words.

Self-efficacy judgments. Means and standard deviations for self-efficacy judgments are presented by treatment condition in Table 2. There was no difference in self-efficacy judgments between less proficient learners who heard the model verbalize strategies and those who observed a silent model, (Hypothesis 6). Less proficient learners who heard the model and also self-

verbalized did not have higher self-efficacy judgments than those who merely observe the verbalizing model, (Hypothesis 7).

Hypothesis 8, that at follow-up less proficient learners who heard the model verbalize strategies and themselves verbalized would have higher self-efficacy scores than those who just observed the verbalizing model, could not be tested with a *t*-test. Because of missing data as well as subjects lost when the subset was formed, the resulting *n* was too small.

Fisher's exact test was performed after splitting the self-efficacy scores according to where they fell in relation to the mean. The two groups were not significantly different. The mean for self-efficacy judgments at follow-up in the group that self-verbalized after observing the verbalizing model was 60. The corresponding mean for subjects who worked silently after observing the self-verbalizing model was 31. This difference is in the predicted direction.

Table 2

Less Proficient Learners
Means and SD as a Function of Experimental Treatment

| | | | Silent model | | | | Verbalizing model | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Control | | Silent | | Self-verb[a] | | Silent | | Self-verb[b] | |
| Measure | M | SD | M | SD | M | SD | M | SD | M | SD |
| Self-efficacy | | | | | | | | | | |
| Pretest | 55 | 25 | 34 | 31 | 36 | 25 | 37 | 33 | 46 | 33 |
| Posttest | 58 | 21 | 49 | 28 | 44 | 30 | 46 | 24 | 52 | 34 |
| Follow-up | 43 | 28 | 55 | 32 | 44 | 30 | 31 | 20 | 60 | 35[c] |

Note. n = 10 except as noted. [a] n = 8. [b] n = 5 [c] n = 3.

Self-efficacy and performance. For less proficient learners alone, the correlation between self-efficacy judgments at pretest and maze performance at pretest was very small and not significant, r = .01. The correlation between self-efficacy and maze performance at posttest was also not significant, r = -.03. At follow-up the correlation between self-efficacy judgments and performance for less proficient learners was positive and significant, r = .28, p<.05.

Proficient Learners

Maze performance. Means and standard deviations for maze performance for proficient learners are presented in

Table 3. There was no difference at posttest between proficient learners who observed the silent model compared to those in the control group who did not observe the model (Hypothesis 9). There was also no difference in performance at posttest between subjects who observed the silent model and those who observed the verbalizing model (Hypothesis 10).

Hypothesis 11 predicted that proficient learners who heard the model verbalize strategies would have higher maze performance scores at follow-up than proficient student who observed a silent model. At follow-up there was a significant effect for treatment groups, $F$ (4,41) = 3.41, $p<.02$. Hypothesis 11 was not confirmed. Subjects who had observed the silent model performed as well as those who had heard the model verbalize strategies. However, a post hoc test indicated that subjects who viewed the silent model and then self-verbalized during training and posttest performed significantly less well at follow-up than subjects in the control group and subjects in the two groups that performed silently at posttest.

Although no prediction had been made comparing the performance of these groups at follow-up, this finding is contrary in direction to the prediction made in Hypothesis 9. The groups that viewed the silent model were expected to perform better at posttest than the

control group. This prediction was not supported, and at follow-up the the group that viewed the silent model and self-verbalized performed less well rather than better. Figure 2 displays the maze performance scores for the proficient learners.

Table 3

Proficient Learners
Means and SD as a Function of Experimental Treatment

| | | | Silent model | | | | Verbalizing model | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Control | | Silent | | Self-verb[a] | | Silent | | Self-verb[b] | |
| Measure | M | SD | M | SD | M | SD | M | SD | M | SD |
| Maze Performance | | | | | | | | | | |
| Pretest | .80 | .11 | .74 | .10 | .80 | .05 | .77 | .06 | .80 | .03 |
| Posttest | .86 | .09 | .83 | .09 | .77 | .32 | .91 | .08 | .79 | .26 |
| Follow-up | .87 | .14 | .88 | .11 | .57 | .41 | .87 | .09 | .84 | .18 |

Note. N = 10 except as noted. [a] N = 9 [b] N = 7

Verbalization and performance. In order to determine whether subjects' amount of verbalization was associated with maze performance, the verbalizations of subjects who had observed the silent model and then self-verbalized were scored for number of words at posttest. The children in this group averaged 77 words per child during posttest. A Pearson correlation betweeen number of words

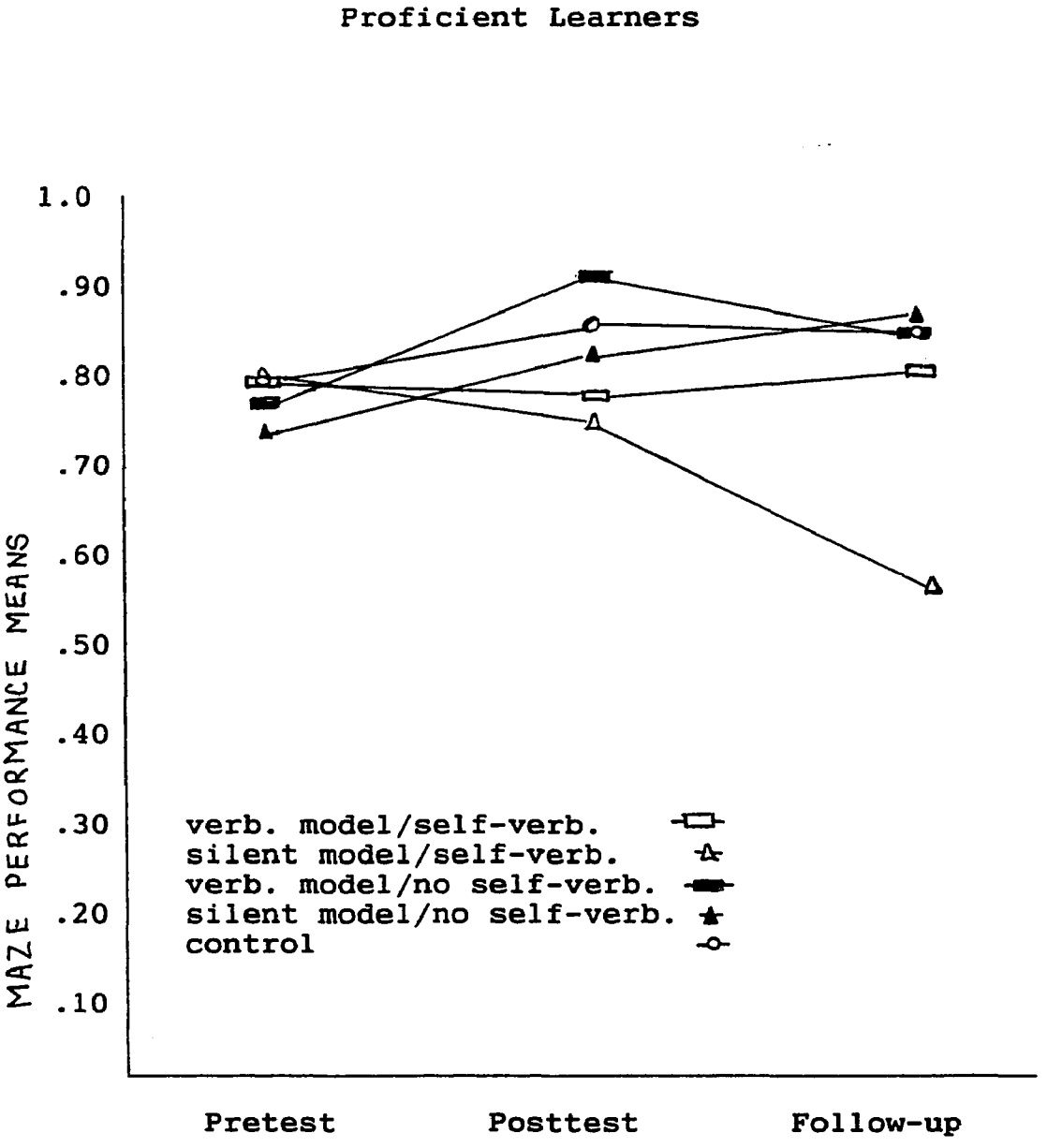



Figure 2. Maze performance means for proficient learners at pretest, posttest, and follow-up.

at posttest and maze performance at follow-up was negative and significant, $r = -.55$, $p<.05$. More verbalization in this condition was associated with poorer maze performance.

Self-efficacy judgments. Means and standard deviations for self-efficacy judgments are presented by treatment condition in Table 4. There was a trend for proficient learners who observed the silent model during training to have higher self-efficacy scores at posttest compared to those in the control group who did not observe a model, $t$ (26) = -1.89, $p<.10$ (Hypothesis 12). There was not, however, any difference in self-efficacy scores between subjects who observed the silent model and those who observed the verbalizing model during training (Hypothesis 13). At follow-up there was a trend for subjects who observed the silent model to have higher self-efficacy scores than those who observed the verbalizing model, $t(30) = 1.99$, $p<.07$. This difference was in a direction opposite to that predicted in Hypothesis 14.

Self-efficacy and performance. For proficient learners alone the correlation between self-efficacy judgments and performance at pretest was small and not significant, $r = -.02$. The correlation between self-efficacy and performance at posttest was also not significant, $r = -.11$. At follow-up the correlation

between self-efficacy judgments and performance for proficient learners was somewhat larger and came closer to being significant, $r = .23$, $p = .074$. The lower correlations between maze performance and self-efficacy for proficient and less proficient learners as separate groups are due to the restriction of range inherent in these groupings.

Table 4

Proficient Learners
Means and SD as a Function of Experimental Treatment

| | Silent model | | | | | | Verbalizing model | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Control | | Silent | | Self-verb[a] | | Silent | | Self-verb[b] | |
| Measure | M | SD | M | SD | M | SD | M | SD | M | SD |
| Self-efficacy | | | | | | | | | | |
| Pretest | 62 | 21 | 70 | 33 | 71 | 25 | 64 | 28 | 60 | 33 |
| Posttest | 62 | 28 | 84 | 22 | 77 | 25 | 70 | 24 | 83 | 24 |
| Follow-up | 66 | 34 | 92 | 14 | 70 | 21 | 63 | 29 | 60 | 36[c] |

Note. $n = 10$ except as noted. [a] $n = 9$ [b] $n = 7$ [c] $n = 6$.

Comparisons Between Proficient and Less Proficient Learners

Maze Performance. A one-way analysis of variance was used to compare the entire group of proficient

learners with the less proficient learners as a group. At pretest all groups of proficient learners differed significantly from all groups of less proficient learners, $F$ (9,79) = 34.5, $p<.001$. At posttest proficient learners in the control group and in the two groups that performed silently, with or without having seen a verbalizing model, achieved higher maze performance scores than the less proficient learners in the control group, $F$ (9,79) = 3.38, $p<.001$. At follow-up no pairs of groups differed significantly.

Self-efficacy. No two groups had significantly different self-efficacy means at pretest. At posttest proficient subjects in the silent model, silent performance goup had higher self-efficacy than less proficient subjects in both the silent model, self-verbalization and the verbalizaing model, silent performance groups, $F(9,79) = 3.02$, $p<.005$. At follow-up proficient learners in the silent model and silent performance group also had higher self-efficacy scores than less proficient subjects in the control group as well as the two groups mentioned above, $F = 3.02$, $p<.005$.

The results for self-efficacy did not conform with any of the predictions or hypotheses presented. One hypothesis is that children this age are not reliably self-evaluative. An informal examination of the data seemed to indicate more consistency within subjects than

within treatments. Correlations between self-efficacy judgments at different time points were done. The Pearson correlation between self-efficacy after pretest and after posttest was $r = .60$, $p<.001$. The Pearson correlation between self-efficacy after posttest and after follow-up was $r = .65$, $p<.001$.

Sex Differences

No predictions were made regarding sex differences. However, analysis of maze performance scores and self-efficacy judgments by sex revealed some significant differences. Maze performance and self-efficacy scores for all subjects are presented for males and females separately in Table 5. For each significant difference males had higher maze performance scores and higher self-efficacy scores. At follow-up maze performance score were not significantly different for boys and girls, but boys continued to make higher self-efficacy judgments than girls.

Table 5

Maze Performance and Self-efficacy for Males and Females

| | Maze Performance | | | | | Self-efficacy | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Males (n=37) | | Females (n=52) | | | Males (n=37) | | Females (n=52) | | |
| | M | SD | M | SD | F(1,87) | M | SD | M | SD | F(1,87) |
| Pretest | .58 | .32 | .42 | .35 | 4.85* | 69 | 31 | 43 | 26 | 18.33** |
| Posttest | .77 | .27 | .62 | .36 | 4.26* | 71 | 30 | 57 | 26 | 5.65* |
| Follow-up | .76 | .29 | .67 | .32 | 2.06 | 68 | 33 | 50 | 28 | 6.92* |

Note. At follow-up ns for self-efficacy are males = 33, females = 47. * p<.05 ** p<.001

Table 6 presents maze performance and self-efficacy scores for males and females in the less proficient group. For this group there were no differences in maze performance. Boys had higher self-efficacy scores at both pretest and follow-up.

Males and females in the proficient group displayed no significant differences in maze performance. At pretest the boys had higher self-efficacy scores; the means are presented in Table 7. At posttest and follow-up there were no differences in self-efficacy scores.

Table 6

*Maze Performance and Self-efficacy for Less Proficient Males and Females*

| | Maze Performance | | | | | Self-efficacy | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Males (*n*=13) | | Females (*n*=30) | | | Males (*n*=13) | | Females (*n* = 30) | | |
| | *M* | *SD* | *M* | *SD* | *F*(1,41) | *M* | *SD* | *M* | *SD* | *F*(1,41) |
| Pretest | .21 | .24 | .16 | .20 | .60 | 58 | 38 | 34 | 21 | 7.30* |
| Posttest | .61 | .35 | .48 | .38 | 1.23 | 58 | 31 | 46 | 23 | 2.15 |
| Follow-up | .60 | .36 | .60 | .34 | .001 | 61 | 35 | 37 | 21 | 7.31* |

*Note*. At follow-up *n* for self-efficacy for females is 27.

*$p<.05$

Table 7

*Maze Performance and Self-efficacy for Proficient Males and Females*

| | Maze Performance | | | | | Self-efficacy | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Males (n=24) | | Females (n=22) | | | Males (n=24) | | Females (n=22) | | |
| | M | SD | M | SD | F(1,44) | M | SD | M | SD | F(1,44) |
| Pretest | .78 | .07 | .78 | .09 | .01 | 75 | 26 | 56 | 25 | 6.13* |
| Posttest | .85 | .16 | .82 | .21 | .26 | 78 | 27 | 71 | 23 | .68 |
| Follow-up | .86 | .20 | .76 | .27 | 1.90 | 73 | 31 | 68 | 26 | .24 |

*Note*. At follow-up *ns* for self-efficacy for males and females are 20. *$p<.05$

## Chapter 5

## Discussion

The present study was designed in part to clarify conflicting findings on the effectiveness of self-verbalization training. It was proposed that inconsistencies in the literature could be explained by a finding that self-verbalization is differentially effective for proficient and less proficient learners. The general notion that there would be a different pattern of results for proficient and less proficient learners was supported. The findings for the proposed hypotheses will be discussed below.

Less Proficient Learners

Hypothesis 4 predicted that less proficient students who saw and heard a model using a strategy and then self-verbalized would perform better at posttest than those who viewed the model but did not self-verbalize. This hypothesis was not supported. Hypothesis 5 made the same prediction for less proficient students at follow-up. Hypothesis 5 was supported: Less proficient children who had verbalized at posttest had more success with the follow-up maze than those who had seen the model and worked silently at posttest. This result indicates that for this group of learners self-verbalization does add something beyond direct instruction.

Asarnow and Meichenbaum (1979) found that children who did not initially use a rehearsal strategy on a serial recall task were more benefitted by traditional self-instruction training than by induced rehearsal. Positive effects were seen both at posttest and follow-up. These results are partly consistent with those of the present study in that the least proficient students were benefitted by only the strongest self-verbalization treatment. However, the self-instruction procedure used by Asarnow and Meichenbaum included questions and answers concerning the nature and demands of the task, statements about the value of the strategy, and self-reinforcement as well as coping self-statements. These researchers

found that induced rehearsal was no better than simple practice.

Because the tasks involved and the necessary strategies are quite different in the two studies, comparison between them is limited. The task used in the Asarnow and Meichenbaum study appears to be more susceptible to a passive response and to guessing. The maze task in the present study presented subjects with clear evidence of their lack of success and may have called forth more effort to be strategic. The present study shows that the various steps that are traditionally included in self-instruction training are not always necessary in order for self-verbalization to be effective. This study also provides additional support for a procedure in which subjects choose their own words while self-verbalizing. This methodology has been used effectively by Schunk (1982; 1986).

Wilder et al (1984) presented normal and learning disabled students with the Tower of Hanoi problem. The learning disabled students benefitted most when they said aloud a reason for each move that they made. The non-learning disabled students benefitted most when they thought of a reason to themselves. Although the present study did not use a learning disabled population, similar results were obtained with a population defined in terms of low task proficiency.

The results of the present study do not show the benefits for self-verbalization during posttest when subjects were actually verbalizing. The beneficial effects are seen only at follow-up when subjects are typically doing little, if any, verbalizing. The lack of improvement at posttest may reflect an interference effect of self-verbalization: The act of verbalizing may interfere with some types of motor performance. However, for the less proficient learners, self-verbalization did enhance future performance.

Bandura and Jeffrey (1973) found that the advantages of symbolically coding and rehearsing familiar memory codes increased over time. They also found that physical practice of a model's complex movement configurations without coding was no better than a no rehearsal condition. The authors suggest that involvement in motor activities reduces the opportunity to code responses into easily remembered words or images. In the present study the requirement that subjects self-verbalize while drawing the path through the maze presented them with an additional motor task and may account for the lack of significant improvement at posttest. However, the subjects who verbally rehearsed the strategy at posttest remembered how to apply it at a one week follow-up. At follow-up there were no instructions regarding self-verbalizatons, and most subjects chose to work silently.

Hypothesis 3 predicted that less proficient learners who heard the model verbalize would do better than those who observed a silent model. This hypothesis was not supported. There was no difference in performance at posttest between these two groups. The children who heard the model verbalize strategies and then performed silently had the highest maze performance scores at posttest, although no significant differences were found in post hoc analyses.

There was no prediction made regarding differences at follow-up between those who had heard the model and those who had only seen her because it appeared unlikely that less proficient learners who heard but did not self-verbalize the strategy would both retain and use it. As the results for Hypothesis 6 show, this is apparently the case. At follow-up the mean maze performance score for those students who heard the strategy but did not self-verbalize was virtually the same as for those who saw only the silent model.

This study was also a test of the hypothesis that less proficient performance was associated with a state orientation as defined by Kuhl (1984). Hypothesis 1, which predicted that less proficient learners would have higher state orientation scores than proficient learners, was not supported. The present study used an adaptation of Kuhl's cognitive orientation measure which was

designed to distinguish between subjects who favor an action orientation and those who are inclined to cogitate or engage in unproductive reflections when encountering obstacles. The adaptation of Kuhl's measure was designed with fewer items and with slight modification of content to make items more meaningful to children. Both proficient and less proficient learners achieved rather low scores, indicating an action rather than state orientation. The small range of scores also accounts for the rather low reliability coefficient.

Children, it appears, are by nature action oriented. Although they may sometimes respond with unproductive cognitions in problem situations, they are disinclined to report that this is the case. For example, very few children responded that they become upset when the teacher says their work is not good enough. All but a few chose the alternative response that they try harder.

The recorded and transcribed record of what the children said during pretest indicates that the less proficient learners are indeed more likely to make negative statements such as, "this is hard" or, "I made a lot of mistakes." Almost half of these students made negative statements at pretest. Some verbalizations were of a neutral or self-regulatory variety such as, "Don't go through the wall." Others were were very general and appeared to have little strategic content such as, "I

have to find the right way to go to this door." Many students also made elliptical or exclamatory statements: "Oops...go around here." A number of students refused to talk aloud during pretest or spoke no more than a few words. This type of response provided no evidence regarding the presence or absence of disruptive self-referent thought.

The self-verbalization that was elicited in this study cannot be compared with that observed by researchers such as Roberts (1979) or Zivin (1972, cited in Fuson, 1979). The naturalistic studies conducted by these authors looked at spontaneous private speech. Roberts allowed children to work in privacy and recorded their speech via microphones, whereas in this study the children were told to say aloud what they were thinking and were prompted to do so if they did not. The experimenter's presence may have been an inhibiting factor. However, in one respect this study supports Roberts' results. The less competent children made more negative evaluative statements than did their more competent peers.

This study does not provide a clear answer to the question of how self-verbalization helped the less proficient students improve their performance significantly at follow-up. However, the pattern of results, as well as anecdotal evidence, provide some

indications that self-verbalization induces strategic behavior. As noted earlier, all children in treatment groups that heard the model verbalize the strategy were asked at the conclusion what they remembered of what the model said and did. Children's responses to this question and their maze performance differed depending on whether they only heard the model or whether they heard and self-verbalized.

The responses of the group that heard the model but did not self-verbalize will be examined first. Five of the ten children remembered the main idea of the strategy. These five also solved the follow-up maze, although none achieved perfect scores. Of the other five who could not repeat the strategy, four could not solve the follow-up maze. One child could not express the strategy very well but did succeed in solving the maze.

In the group that heard the model and was supposed to self-verbalize, there were originally ten subjects. Only five of them complied fully with the treatment. However, for purposes of comparison the responses of the five noncompliant subjects provide additional anecdotal information. Nine of the original ten subjects in the group were able to reply with the main idea of the strategy. Since five of these children did not comply with the self-verbalization training during posttest, the basis for their more accurate memory (compared to the

group that only heard the model) must have been the small amount of rehearsal they received on the practice maze. The five children who did comply with the instructions to self-verbalize during posttest not only remembered, but also successfully used the strategy at follow-up. Two of them achieved perfect scores.

All of those who complied with the self-verbalization instruction successfully solved the follow-up maze. This success rate is contrasted with a success rate of fifty per cent in the group that heard but did not self-verbalize the strategy. A third comparison can be made with the group of five noncompliant subjects who heard the strategy and received minimal practice with self-verbalizing it. Three of these five children or sixty per cent solved the follow-up maze.

In conclusion, having less proficient children self-verbalize a strategy greatly increases the likelihood that they will remember it. Several authors have suggested that self-verbalization helps children organize, code, and store information in memory and that this then improves future retrieval and use (Loper & Murphy, 1985; Schunk, 1986). The results of the present study support this view. A small amount of practice enabled subjects to recall the strategy. However, more extensive self-verbalization ensured that they would use it successfully in the future. The results of this study

are consistent with those studies which show that domain specific knowledge and the ability to organize and apply that knowledge are learned together. Self-verbalization may be one procedure for inducing strategic behavior in students who would not otherwise organize and apply knowledge that is readily available to them.

It was not necessary that the student apply the strategy correctly while verbalizing, because several subjects verbalized the strategy while failing to solve the posttest maze. In fact, one subject repeated in a rote manner, "I have to find the doorway," although she did not make the correct motor movements. She failed to clear any of the correct choice points (gates) of the maze; but when tested one week later, she achieved a perfect score. Another student also failed to solve the maze at posttest during which she dutifully repeated an appropriate strategy. At follow-up she completed the maze with a gate ratio of .80. Similar responses were observed by Robin et al (1975) when training kindergarten children to improve letter copying. Children's use of self-instructions was not correlated with correct letter copying, although improvements in writing of letters was observed. This pattern of results is again consistent with the finding of Bandura and Jeffrey (1973) who noted that symbolic rehearsal, but not motor rehearsal, improved performance.

At least one child appeared to have gained in confidence as a result of seeing and hearing the model. During the pretest he stated, "This one's really confusing....I don't think I can solve this maze....This is impossible." When presented with the posttest maze, he immediately [and incorrectly] stated, "This one's a lot easier than the other." This subject solved both the posttest and follow-up mazes. Another subject partially modified the strategy the model had used by tracing through the entire maze with her finger as well as doing it in sections. Her verbalizations matched her actions, and she solved the postest maze with four errors, the follow-up maze with one error.

As noted earlier, not all subjects complied with instructions to self-verbalize. This suggests that a number of subjects in the groups that heard the strategy were unaware of the value of using it. Although the model on the videotape stated her intention to solve the maze and repeated the strategy 11 times, she did not make attributional statements about the strategy. Some researchers have indicated that subjects are more likely to use strategies if the training includes a component attributing success to use of the strategy (Reid & Borkowski, 1987). Subjects in all of the groups that heard the strategy might have shown comparatively better performance on the posttest and follow-up mazes had they

been more aware and convinced of the value of the strategy being modeled.

Proficient Learners

It was not expected that proficient learners would benefit from the self-verbalization procedure. The results supported this general prediction. Several hypotheses did predict that the more proficient students would benefit from modeling. Hypothesis 9 predicted that those observing the silent model would perform better at posttest than the control subjects. Proficient students observing the verbalizing model were expected to do better at posttest than those who saw the silent model. Neither of these hypotheses was supported. At follow-up those who had observed the verbalizing model were expected to perform better than those who had seen the silent model, but this hypothesis also did not receive support. The more proficient students showed only modest improvements in performance from pretest to follow-up. This was due at least in part to ceiling effects. Many of the proficient learners already had an effective stratetgy for solving the maze and had little room for improvement.

An unexpected finding emerged with the more proficient learners. Those who had viewed the silent model and then self-verbalized performed significantly less well at follow-up than the children who did not

self-verbalize. The silent model/self-verbalization group did not differ significantly from the group that viewed the verbalizing model and then self-verbalized. When the five groups of proficient children were compared with the five corresponding groups of less proficient children, only the proficient groups which performed silently achieved significantly higher scores at posttest than the less proficient controls.

The trend toward poorer performance among proficient students who are instructed to verbalize suggests not only that they are not benefitted by self-verbalization, but that they are hindered. The group that viewed the silent model and then had to verbalize was particularly handicapped. The groups that performed silently, including the controls who saw no model, did not experience this handicap. The group that saw the verbalizing model and then verbalized had the handicap of self-verbalization, but it may have been offset by the fact that they were verbalizing a strategy. These results are consistent with those of Zimmerman and Bell (1972) who found that children were less able to infer a rule when they were required to actively describe the model's behavior than when they were allowed to observe passively.

The interference which the subjects in this study experienced may be explained by the dual coding theory of

Allan Paivio (1971). Paivio has proposed that there are two independent but interconnected representational systems involved in cognition. The nonverbal subsystem is specialized for processing information about nonverbal objects and events, and the verbal subsystem is specialized for processing language. The two representational subsystems are activated when a child becomes involved in a cognitive task. They may be activated either individually, in parallel, or interactively. How the subsystems are activated depends on the task materials, task requirements, and individual differences in representational skills. The interconnections between the two systems would permit mental translation from the nonverbal to the verbal (the child presented with a shape names it) and from verbal to nonverbal (a word evokes an image).

Johnson, Paivio, and Clark (1989) had children complete a tactual-to-visual crossmodal recognition task which required them to identify a shape after tactual exploration. Some subjects were instructed to think about how the shape looked (imagery instructions) while others were told to give the shape a name. Better performance under imagery instructions was associated with visuospatial ability, and better performance under naming instructions was associated with verbal referential skill. When ability variables were not taken

into account, there were no differences between the groups which got the different instructions. Within a group receiving imagery instructions, there would be found some subjects with better visuospatial ability, and they would perform especially well. Those children who had better verbal ability would do somewhat poorly with visuospatial instructions, producing an overall result in which better performances would cancel out poorer performances. These results suggest that the cognitive performance of children who lack the prerequisite abilities may not be benefitted and may even be harmed by the requirement to use a specific strategy.

Paivio's dual coding theory could explain the lack of treatment effects seen in proficient subjects in the present study. Measures of ability in visuospatial and verbal representation were not obtained; however, some subjects can be assumed to have been stronger in visuospatial ability than in verbal ability. Yet, they were required to implement a strategy which involved speaking aloud and naming parts of the maze such as "the next doorway" and "dead ends."

The proficient children in particular would have been in possession of some strategy initially and most affected by an experimental treatment which attempted to impose a strategy incongruent with their pattern of abilities. Those in the group that viewed the silent

model were allowed to observe her performance passively, as were all subjects. However, when given the opportunity to translate their observations into performance, the children had to verbalize while drawing the path through the maze. They had had no guidance regarding strategic verbalizations and, in several cases, produced completely irrelevant verbalizations. For some children this may have constituted a double handicap: verbalization instruction when imagery would have been preferred and irrelevant verbalizations as well.

Why did only the proficient subjects who self-verbalized after silent modeling show diminished performance at follow-up? This result was not seen with less proficient children receiving the same treatment. The most parsimonious explanation may be that the more proficient children talked more. The average number of words per child at posttest was 77 in this group. The less proficient children averaged only 36 words per child at posttest in the corresponding group. Zivin (1972, cited in Fuson, 1979) observed that four year olds who talked more performed less well on finger mazes.

It seems possible that the requirement to verbalize did more than interfere with the children's ability to infer and practice applying a strategy. There may have been experimental demands created which gave these children the impression that they were supposed to be

doing something to improve their performance on the task. Yet, they were instructed to do something which hindered their performance. Several subjects, having solved the pretest maze, failed to solve the posttest maze when they were verbalizing. These children invariably failed the follow-up maze. This pattern of results was not seen among any of the other subjects in the proficient group.

Additional anecdotal evidence for the interfering effects of self-verbalization for proficient learners comes from the children themselves. Many simply stated that they could not talk aloud while working, as the following remarks indicate:

> I can't really think and do a maze at the same time.
>
> I think it would be a little bit easier to do the maze if I wasn't talking.

When instructed to talk aloud about what he was thinking, one subject stated quite frankly, "I'm not thinking about nothing. I don't think."

Self-efficacy

Hypothesis 2 predicted that there would be a positive correlation between pretest self-efficacy scores and maze performance. This hypothesis was supported. It was also expected that treatment effects would be reflected in self-efficacy scores. Hypthesis 6 predicted that less proficient learners who heard the model verbalize would have higher self-efficacy scores than those who observed a silent model. It was also predicted

(Hypothesis 7) that less proficient children who heard the model and then self-verbalized would have higher self-efficacy scores than those who simply heard the model. These hypotheses were not supported. Hypothesis 8 made the same prediction for follow-up that Hypothesis 7 made for posttest, that less proficient learners who heard the model and self-verbalized would have higher self-efficacy scores than those who just heard the model. This hypothesis was also not supported.

For proficient learners Hypothesis 12 predicted that those who observed the silent model would make higher self-efficacy judgments than those in the control group. This hypothesis was not supported. Hypothesis 13 predicted that proficient students who heard the model verbalize strategies would have higher self-efficacy than those who had observed a silent model. The same prediction (Hypothsis 14) was made for self-efficacy scores at follow-up. Neither of these hypotheses was supported. Since the proficient learners did not for the most part differ in maze performance among the treatment groups, it is not surprising that no differences are found in self-efficacy either. One might logically expect, however, to find lowered self-efficacy in the group that viewed the silent model and self-verbalized because they performed less well at follow-up. There is no evidence of decreased self-efficacy in this group at

posttest or follow-up.

In general, the results for the self-efficacy measure were unclear. Although the positive correlation between self-efficacy and maze performance scores suggests that children who perform better also make prediction of future success, treatment effects did not emerge. The rather strong correlations between self-efficacy judgments within subjects indicates that individual differences may be an important source of error in this data. The tendency to make either high or low self-efficacy judgments may be stronger at this age level than the child's susceptibility to performance feedback. A number of children in the less proficient groups made predictions of success after experiencing failure, while others stuck to judgments of "not sure" or "maybe" after solving both the posttest and follow-up mazes. There were also sex differences in self-efficacy resulting in boys tending toward higher self-efficacy scores. This is an additional source of error.

## Recommendations for Future Research

The finding that self-verbalization is effective for less proficient learners but not for more proficient learners should be replicated. It would be important to know if this difference holds up when the more proficient group demonstrates less task proficiency than did the

subjects in this study.

In a future study we might use subjects in the proficient group who are more error prone, although they would need to demonstrate some task proficiency as a contrast with the less proficient group. In this study the more proficient group showed only modest improvements partly because they did not have that much room for improvement.

Alternatively, use of a strategy could be the criterion for distinguishing proficient from less proficient learners. Asarnow and Meichenbaum (1979) included subjects who demonstrated inconsistent use of a rehearsal strategy and compared them with children who displayed no apparent use of the strategy. Assuming that strategy use can be observed and measured, future studies could explore whether self-verbalization is differentially effective for groups that vary in strategy use rather than task proficiency, as was done in this study.

The finding that self-verbalization interferes with performance should also be investigated further. This study used a task with a significant motor component, drawing the path through a maze. Would a task with less of a written component show less interference from self-verbalization? The fact that the task chosen was visual/spatial rather than semantic may also have been a

factor in the results obtained. Frauenglass and Diaz (1985) suggest that spontaneous private speech is more likely to occur in younger children (3 1/2-6 yr.) when they are engaged in semantic tasks than when they are engaged in perceptual tasks. Future research would have to explore whether training in self-verbalization for older children would follow this pattern. Future studies might look at the effectiveness of self-verbalization on a writing task which combines both semantic/linguistic and motor components.

Future research might further explore factors which seem to be associated with the poorer performance of proficient students under self-verbalization conditions. Such as study could define proficiency in terms of Paivio's dual coding theory and seek to determine a relationship between verbal referential skill and the effectiveness of self-verbalization training.

Compliance with self-verbalization training was a problem in the present study. A more extensive training procedure might have increased the number of children who complied with instructions. Future research should explore variations in the training procedure which might interact with performance. A training procedure which emphasizes the value of the strategy could be compared to one which simply models it.

This study indicates that self-constructed

verbalizations are effective. It was not necessary to teach the children to make a particular set of statements as is traditionally done in self-instruction training. Future research need not employ the traditional self-instruction paradigm in order to explore the efficacy of self-verbalization. Bandura (1986) has suggested that the different facets typically included in the self-verbalization procedure may be redundant. A future study might look more closely at the content of subjects' self-verbalizations in order to discover those which are associated with more strategic performance. Such a study would examine subjects' use of trained self-verbalization as oppposed to naturalistic studies of spontaneous self-verbalization.

The findings for self-efficacy in this study were very limited. It is recommended that future studies explore the predictive validity of self-efficacy measures in this age group. The existence of individual and sex differences needs to be investigated. Future studies might examine self-efficacy across tasks and within the same individuals. Accuracy of self-evaluation could also be trained in a future study to see whether the predictive validity of the self-efficacy measure could be improved in six to nine year old subjects.

This study also failed to discover a relationship between students' scores on Kuhl's state or action

orientation scale and their performance on the task. Future research could explore other methodologies for ascertaining whether the presence of self-evaluative thought and ruminations interfere with performance. Future studies might incorporate a more extensive interview following a failure experience. In addition, allowing subjects to work in private might elicit more spontaeous self-reflective speech.

Educational Implications

This study shows that self-verbalization training does induce strategic behavior in students who initially are unable to solve a task. However, performance does not improve during the time that the child is verbalizing. This result indicates that teachers may help less proficient students by teaching them to self-verbalize, but improved performance should not be expected until the child is no longer verbalizing.

Teachers can expect some students to be resistent to self-verbalization training. More extended training may persuade the unconvinced of the value of self-verbalization. Observation of live models may also be more persuasive than the videotaped model that was used in this study. It is also likely that students will be more inclined to implement a strategy if the instructions include attribution training. Reid and Borkowski (1987) found that children given attribution training which

emphasized controllable factors such as effort and strategy use subsequently used more strategies than children in a group which received self-control training without the attribution component.

As noted earlier, Paivio's dual coding theory predicts that learners will experience improved performance when implementing instructions which activate the coding system in which they have greater ability. Teachers may have greater success with teaching self-verbalization if they can tailor it to the child's pattern of abilities. In the present study some children may have performed better if they had been told to "imagine how the correct path through the maze would look." Such children may not benefit from self-verbalization, or they may benefit from a limited amount of self-verbalization which evokes an image but does not rely greatly on naming.

It is also important that students using self-verbalization be given an explicit strategy. Students six to eight years old are not able to generate strategic statements after observing a silent model. Teachers would want to make sure that students understood a strategy for solving the problem, although they can use their own words when self-verbalizaing. Simply telling students to self-verbalize without ensuring they understand a strategy would appear to be unproductive or

even counterproductive.

Teachers would want to identify those students most in need of strategy training as candidates for self-verbalization training. Although the results of this study indicate that the least proficient students benefit from self-verbalization of strategies, a few of these students showed improvement after just hearing the strategy. Teachers may wish to allow students to choose the approach which seems most comfortable for them, or they can use trial and error to discover whether self-verbalization is beneficial to a particular student. Paivio's (1971) dual coding theory would indicate that some students are more likely to benefit from strategies that rely on verbal skill.

Teachers should also consider carefully whether self-verbalization training may be more likely to enhance performance on some tasks than others. Although it remains for future research to determine whether task differences interact with the effectiveness of self-verbalization training, some authors have indicated that self- verbalization is more likely to occur spontaneously on verbal/semantic tasks (Fraunglass & Diaz, 1986).

Questions remain regarding precisely which group of learners is most likely to benefit from self-verbalization training. However, it appears that those students who have little notion of a strategic approach

to the task will show benefits. Self-verbalization training should be used cautiously, if at all, for the student who already has a somewhat strategic approach. Teachers may wish to explore other self-regulatory procedures for such students.

# Appendix A

## Cognitive Orientation Measure

1. When I've tried several times to get started on a worksheet and I can't get going

   __I start another worksheet pretty soon
   __I don't feel like doing anything at all

2. When the teacher says my work is not good enough

   __then I really try harder
   __at first I am very upset

3. When I can't memorize something even though I've tried and tried

   __I find it hard to start anything else
   __I do something else for a while

4. When something important to me just keeps going wrong

   __I gradually get discouraged
   __I forget about it for a while and do something else

5. When something makes me sad

   __I don't feel like doing anything
   __I try to turn my attention to other things

6. When several things go wrong for me on the same day

   __I really don't know what to do with myself
   __I can still do things as though nothing had happened

7. If I lost something very special and couldn't find it

   __I would have a hard time getting over it
   __I wouldn't think about it for very long

8. If I've worked on making something for a couple weeks and everything turns out wrong

   __It's a long time before I can get over it
   __I don't let it bother me for long

9. When I'm way behind in a game

__I think about how I can make the best of it
__I think about whether or not I might look dumb

10. If somebody is not nice to me

__I'm in a bad mood for quite a while
__it doesn't bother me for long

11. When I have a pain

__I am able to think about other things
__I can hardly think about anything else

12. When I'm taking an important test and I think I'm not doing well

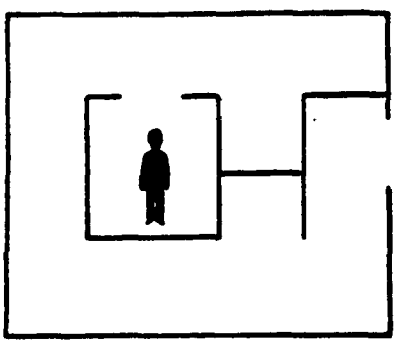
__it gets harder and harder for me to concentrate on the questions
__I don't think much about it until the test is over

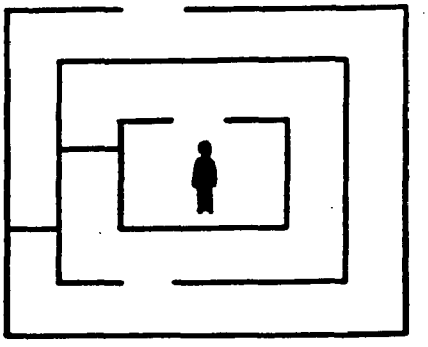
13. When a friend suddenly acts not friendly to me

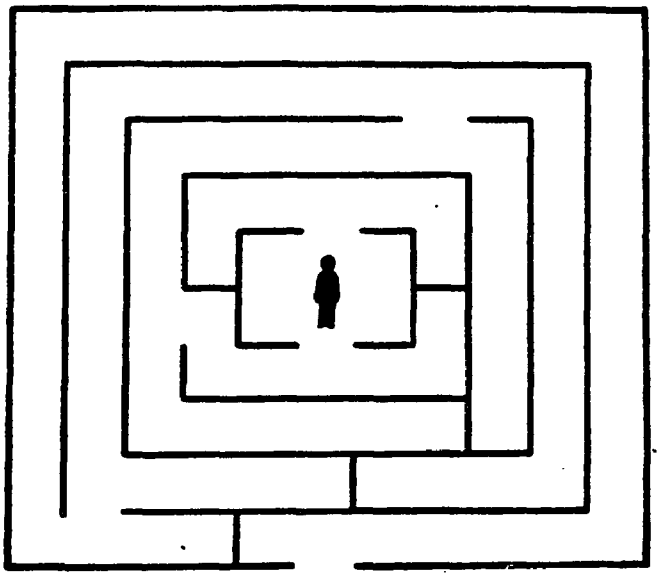
__I think about how I should act toward him/her
__I try to figure out what's the matter

# Appendix B

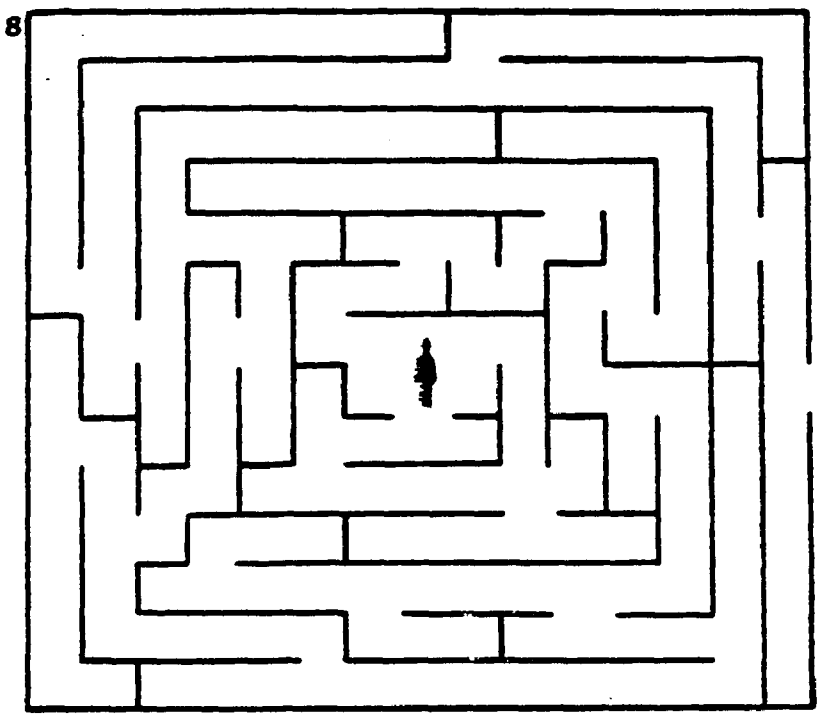
## Practice Mazes



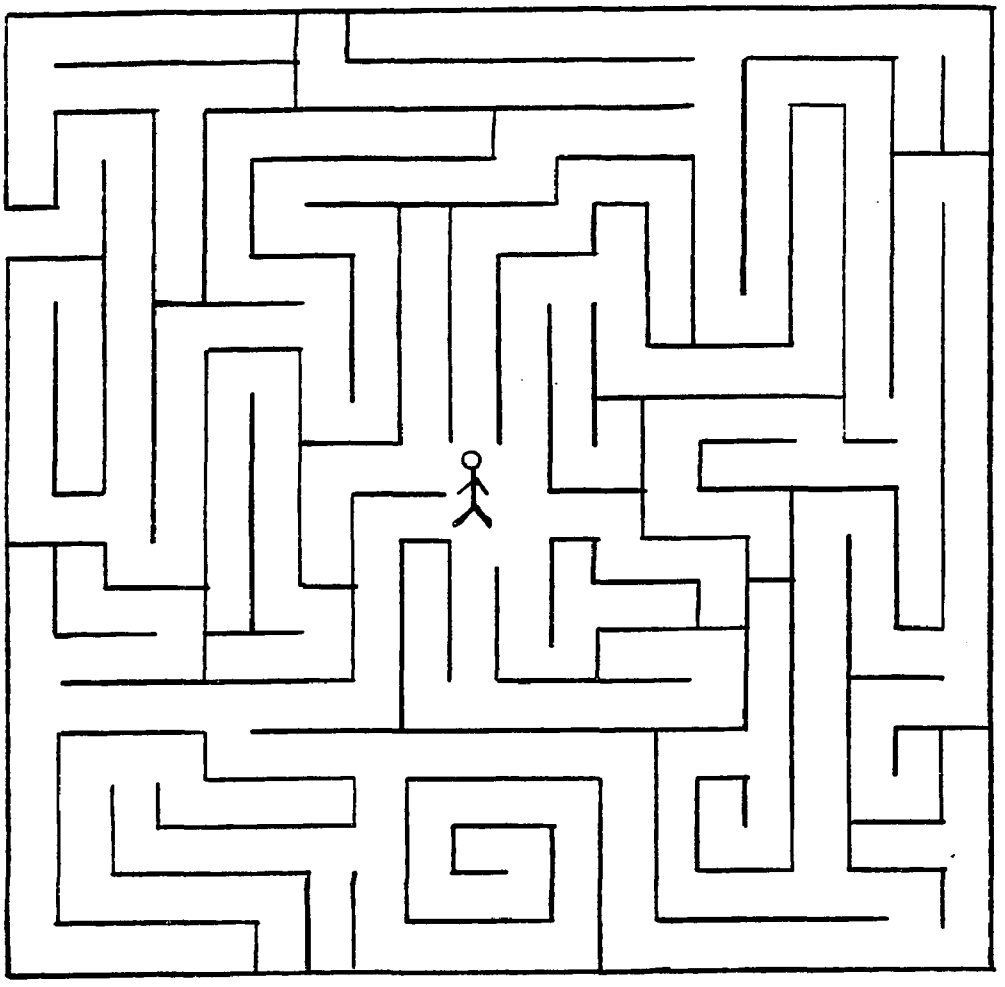




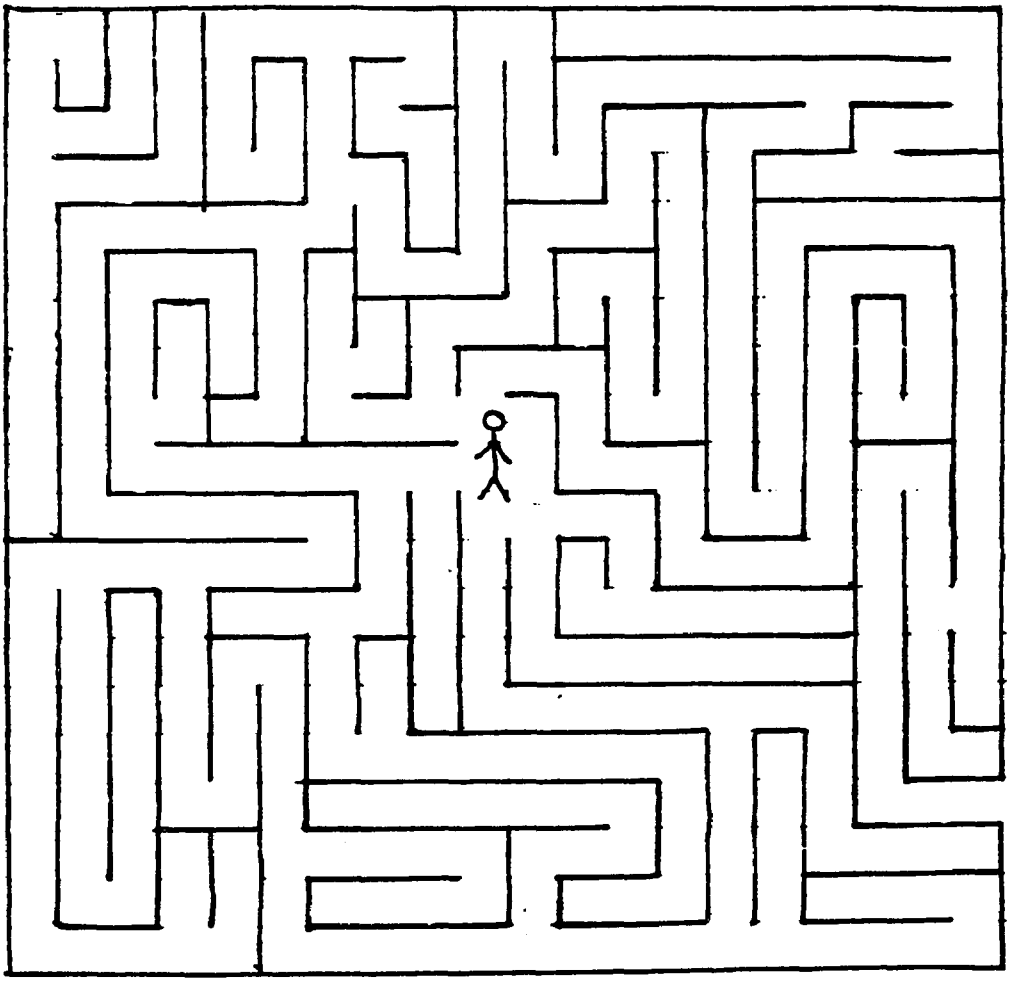
Training Maze



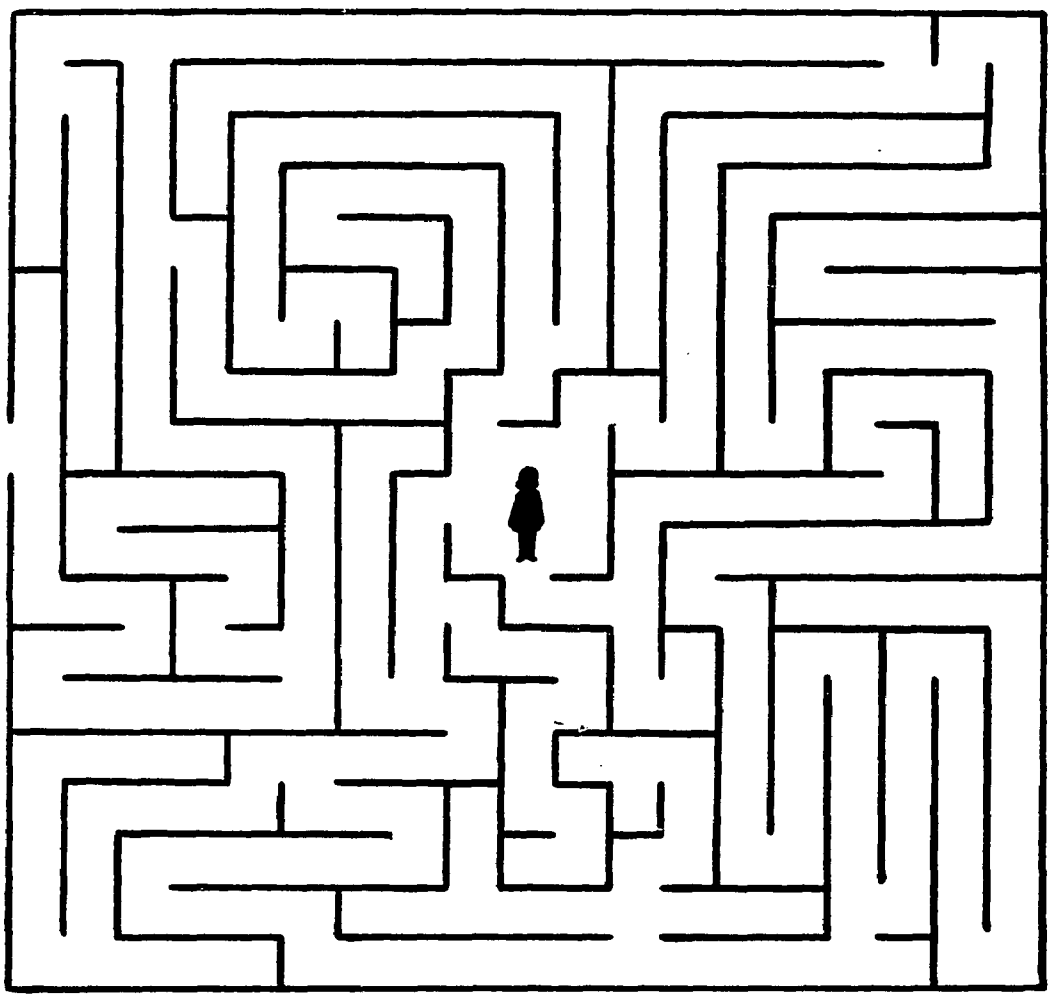
Pretest Maze



**Posttest Maze**



Follow-up Maze



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