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ABSTRACT

This experiment investigated how children's self-efficacy and achievement were influenced by their observing peer models learn a cognitive skill. Within this context, the effects of modeled mastery and coping behaviors were explored. The subjects were 72 children aged 8 to 10 who had experienced difficulties learning subtraction with regrouping operations in their classes. Children observed a same-gender peer demonstrate either rapid (mastery model) or gradual (coping model) acquisition of subtraction skills, observed a teacher model demonstrate subtraction operations, or did not observe a model. Children then judged self-efficacy for learning to subtract, and received subtraction training. Observing a peer model led to higher self-efficacy for learning, posttest self-efficacy, and achievement, than did observing the teacher model or not observing a model. Children who observed the teacher model scored higher than no model subjects on these measures. No significant differences were obtained on any measure due to type of peer modeled behavior (mastery/copying). (Author/MS)

Influence of Peer Models on Children's Self-Efficacy

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Abstract

This experiment investigated how children's self-efficacy and achievement were influenced by their observing peer models learn a cognitive skill. Within this context, the effects of modeled mastery and coping behaviors were explored. The subjects were children who had experienced difficulties learning subtraction with regrouping operations in their classes. Children observed a same-gender peer demonstrate either rapid (mastery model) or gradual (coping model) acquisition of subtraction skills, observed a teacher model demonstrate subtraction operations, or did not observe a model. Children then judged self-efficacy for learning to subtract, and received subtraction training. Observing a peer model led to higher self-efficacy for learning, posttest self-efficacy, and achievement, than did observing the teacher model or not observing a model. Children who observed the teacher model scored higher than no model subjects on these measures. No significant differences were obtained on any measure due to type of peer modeled behavior (mastery/coping).

Influence of Peer Models on Children's Self-Efficacy

According to Bandura (1977, 1981, 1982), psychological procedures change behavior in part by creating and strengthening perceived self-efficacy, which refers to judgments of one's performance capabilities in a given domain of activity. Self-efficacy can influence choice of activities, effort expended, persistence, and task accomplishments. Efficacy information is conveyed through actual performances, vicarious (observational) experiences, forms of persuasion, and physiological indexes (e.g., heart rate).

Modeling is hypothesized to be an important source of information about one's level of efficacy. People can learn new skills from observing others (Rosenthal & Bandura, 1978; Rosenthal & Zimmerman, 1978), and the belief that one has acquired skills can raise self-efficacy (Schunk, 1984). Modeling also is a form of social comparison. Individuals who observe others perform a task are apt to believe that they can as well (Bandura, 1981), because modeling implicitly conveys to observers that they possess the necessary capabilities to succeed (Schunk, 1984). This sense of efficacy is substantiated later as observers successfully perform the task.

Despite these ideas, there is little research on how modeling affects children's self-efficacy. Zimmerman and Ringle (1981) exposed children to an adult model who unsuccessfully attempted to solve a wire puzzle problem for either a high (5 min) or low (30 sec) time period and who verbalized either statements of confidence or pessimism. Children judged their self-efficacy for solving the puzzle before and after the modeling. Compared with children's self-efficacy prior to modeling, children who observed a

pessimistic model persist for 5 min significantly lowered their self-efficacy judgments. Schunk (1981) provided children deficient in division skills with either cognitive modeling of division operations or didactic instruction, along with practice opportunities, over sessions. During cognitive modeling, children observed an adult model verbalize operations while solving problems, whereas didactic children studied explanatory material on their own. Children who received cognitive modeling solved more division problems correctly on the posttest, although both treatments enhanced self-efficacy equally well.

The models in both of these studies were adults. It is possible that modeling would have exerted greater effects on children's self-efficacy had children observed peer models. There is evidence that similarity to models in personal attributes (e.g., gender, age) and in perceived competence (skill, ability) can increase the likelihood of observational learning (Bandura, 1971, 1981; Perry & Furukawa, 1980). People are apt to experience higher self-efficacy for performing a task well when they observe similar others succeed at the task (Bandura, 1981; Brown & Inouye, 1978; Schunk, 1984). These considerations suggest that an adult teacher flawlessly demonstrating cognitive skill operations may not promote high self-efficacy in children; in particular, children who have encountered previous difficulties with the subject matter ought to view the teacher as vastly superior in competence. Models of the same gender and age as children and whom children view as similar in competence might not only teach children skills but also promote their self-efficacy for acquiring those skills.

The purpose of this study was to investigate how peer models affected children's self-efficacy and achievement in a cognitive learning context. The subjects were children who had encountered some difficulties in their classes

grasping subtraction operations that involved regrouping. Subjects either viewed videotapes that portrayed an adult teacher providing subtraction instruction to a child model of the same gender and age as subjects followed by the model solving problems, viewed videotapes that portrayed only the teacher providing instruction, or did not view videotapes. Subjects' self-efficacy for learning to subtract was assessed after the modeling, and all subjects then received subtraction training that included instruction and practice opportunities. Based on the preceding considerations, it was predicted that observing a peer model learning to subtract would enhance self-efficacy for learning more than observing a teacher model or not observing a model, and that subjects exposed only to the teacher model would judge self-efficacy higher than no-model children. In turn, higher self-efficacy was expected to relate to greater skill development.

Within this context, this study explored whether the effects of peer models varied depending on the type of modeled behavior displayed. Among children who have experienced some difficulties learning a cognitive skill, one means of increasing perceived similarity to models might be to use coping rather than mastery models. Coping models initially demonstrate the typical fears and deficiencies of observers but gradually improve their performance and gain self-confidence, whereas mastery models demonstrate faultless performance from the outset (Kazdin, 1974, 1978; Kornhaber & Schroeder, 1975; Meichenbaum 1971; Thelen, Fry, Fehrenbach, & Frautschi, 1979). Coping models illustrate how determined effort and positive self-thoughts can overcome difficulties. Benefits of coping models have been obtained in therapeutic contexts (Thelen et al., 1979), but research is lacking on cognitive skill learning. To the extent that children with skill deficiencies view a coping

model's initial difficulties but gradual progress as more similar to their typical performances than rapid mastery, a coping model might raise self-efficacy more than a mastery model.

In the present study, the peer model displayed either mastery or coping behaviors while solving problems. The peer mastery model easily grasped subtraction operations and verbalized statements reflecting positive achievement beliefs stressing high self-efficacy and ability, low task difficulty, and positive attitudes. The peer coping model initially was hesitant, made errors, and verbalized statements reflecting negative achievement beliefs, but gradually performed better and began to verbalize coping statements. Eventually, the coping model's problem-solving behaviors and verbalizations matched those of the mastery model. It was expected that subjects who observed a coping model would judge self-efficacy for learning higher than those who observed a mastery model.[1]

Method

Subjects

The sample included 72 children drawn from eight classes in two schools. Ages ranged from 8 years 6 months to 10 years 10 months (M = 10.1 years). The 36 girls and 36 boys were predominantly middle class. Children's teachers were shown the subtraction skill test and initially identified 80 children who they felt could not solve more than about 25% of the problems. This selection procedure was followed because this study focused on processes whereby self-efficacy and skills could be developed when they were low. These children had encountered some difficulties learning regrouping operations in their classes, but they were not receiving remedial instruction. It also was felt that the peer model and coping model treatments would appear more

credible to these subjects than to children who would be expected to learn regrouping skills more readily (i.e., normal or high achievers with minimal exposure to subtraction), because the latter subjects might view themselves more similar in competence to the teacher or mastery model. Eight children were excluded from this initial sample for the following reasons: three were excluded because of absences, one was dropped because he was shown the incorrect videotapes, and four others were randomly excluded from the appropriate cells to equalize the cell sizes.

Children were administered the pretest individually by one of seven female adult testers drawn from outside the school. The pretest comprised measures of subtraction self-efficacy, skill, and persistence.

Pretest

Self-efficacy. Self-efficacy for solving subtraction problems correctly was measured following procedures of previous research (Schunk, 1981, 1983). The efficacy scale ranged from 10 to 100 in 10-unit intervals from high uncertainty (not sure--10), to complete certitude (really sure--100). Children initially received practice by judging their certainty of successfully jumping progressively longer distances. In this concrete fashion, children learned the meaning of the scale's direction and the different numerical values.

Following this practice, children were shown 25 sample pairs of subtraction problems for about 2 sec each. This brief exposure allowed assessment of problem difficulty but not actual solutions. The two problems constituting each pair were similar in form and operations required, and corresponded to one problem on the ensuing skill test although they involved different numbers. Children privately judged their capability to solve

different types of problems rather than whether they could solve particular problems. They were advised to be honest and circle the efficacy value that corresponded to their level of certainty. The 25 judgments were averaged.

Skill and persistence. The subtraction skill test, which was administered immediately following the efficacy assessment, comprised 25 problems ranging from two to six columns. These problems tapped one of the following subtraction operations: regrouping once in problems with 2-4 columns, regrouping caused by a zero, regrouping twice, regrouping from a one, and regrouping across zeros. Of these 25 problems, 12 were similar to some of the problems included in the subsequent treatment and training sessions; the other 13 were more complex. For example, during treatment and training children were exposed to regrouping twice, whereas some skill test problems required regrouping three times. The measure of skill was the number of problems solved correctly.

The tester presented the problems one at a time and verbally instructed children to examine each problem, decide how long they wanted to work on it, and place each page on a completed stack when they finished solving the problem or chose not to work on it any longer. Children were given no performance feedback. The tester also recorded the time children spent on problems. These persistence scores were averaged across the 25 problems.

Treatment Conditions

Following the pretest, children were randomly assigned within gender and school (except as noted below) to one of six experimental conditions (ns = 12): male mastery model, male coping model, female mastery model, female coping model, teacher model, no model. Only boys were assigned to the first two conditions; only girls to the second two. This assignment procedure was

followed because children may attend more closely to models of the same gender as themselves (Bandura, 1971; Maccoby & Wilson, 1957), and because the purpose of this study was not to investigate cross-gender modeling. Equal numbers of boys and girls were assigned to the teacher model and no model conditions.

All children in the five model conditions received two, 45-min treatment sessions over consecutive school days, during which they viewed two videotapes that presented the following subtraction operations in 15-min blocks: regrouping once in two-column problems, regrouping once in three-column problems, regrouping once caused by a zero regrouping twice, regrouping from a one, and regrouping across zeros. The first tape covered the first three operations, whereas the second tape covered the second three. Videotapes were used rather than live modeling to insure standardized presentation across subjects. A female teacher, who appeared in all five model conditions, was used because most elementary teachers in the school district were women. One boy served as both the male mastery and coping models; similarly, one girl portrayed the female mastery and coping models. Each child was 10 years 3 months old at the time of videotaping. The teacher and models were drawn from a different school district and were unfamiliar to subjects. All work was conducted at a chalkboard to permit easier viewing.

Male mastery model. Children assigned to this condition viewed the two videotapes in small groups of 4-5. A female adult proctor introduced each tape by stating that it showed a teacher and a boy who was learning to subtract. The first videotape initially portrayed the teacher explaining and demonstrating how to regroup once in two-column problems. Following this 2-3 min demonstration, the teacher wrote a comparable problem on the board for the model to solve. The model performed all operations correctly and worked at an

average rate. While solving the problem the model verbalized aloud the problem-solving operations, along with statements reflecting the following positive achievement beliefs: high self-efficacy (e.g., "I can do that one."), high ability ("I'm good at this."), low task difficulty ("That looks easy."), and positive attitudes ("I like doing these."). On finishing the problem the model was informed by the teacher that his solution was correct, after which the teacher erased the work and wrote another problem on the board. The model solved problems for the remainder of the 15-min block (about 12 min). The model verbalized two different achievement beliefs while solving each problem. On completion of each 15-min block, the teacher explained and demonstrated the next regrouping operation, after which the model was given problems to solve.

After subjects viewed each videotape, the proctor asked them to think about the boy in the tape and judge how much they were like the boy in mathematics. This perceived similarity scale ranged in units of 10 from _not at all_ (0), to _a whole lot_ (100). After viewing the second videotape, subjects' self-efficacy for learning how to solve different types of subtraction problems was assessed. This assessment was identical to that of the pretest except that subjects judged their certainty of _learning_ how to solve different types of problems rather than their certainty of solving them.

Male coping model. The procedures and videotapes shown to the boys assigned to this condition were identical to those of the preceding condition except for the problem-solving behaviors and verbalizations of the model. During the first tape, the model occasionally hesitated and made errors (e.g., forgot to decrease the tens column by one, subtracted incorrectly), at which point the teacher supplied a prompt (e.g., "What do you do first?", and, "No,

better check that."). The model also verbalized two achievement belief statements per problem, but initially these reflected low self-efficacy (e.g., "I'm not sure I can do that one."), low ability ("I'm not very good at this."), high task difficulty ("That looks tough."), and negative attitudes ("This isn't much fun."). As the first tape progressed, the model made fewer errors and began to verbalize coping statements (e.g., "I'll have to work hard on this one.", "I need to pay attention to what I'm doing."). Gradually the model improved his performance so that by the beginning of the second tape he no longer made errors or hesitated and had begun to verbalize statements reflecting positive achievement beliefs. Eventually, the model's problem-solving behaviors and verbalizations matched those of the mastery model. These subjects completed the perceived similarity and self-efficacy for learning measures as above.

<u>Female mastery model</u>. The girls assigned to this condition viewed videotapes that were identical to those of the male mastery model condition except that the girl served as the peer model. These subjects completed the perceived similarity and self-efficacy for learning measures as above.

<u>Female coping model</u>. These female subjects viewed videotapes that were identical to those shown to boys assigned to the male coping model condition except that the peer model was a girl. Perceived similarity and self-efficacy for learning were assessed.

<u>Teacher model</u>. Videotapes shown to these subjects portrayed only the teacher. During each 15-min block, the teacher first explained the appropriate regrou- -ration as in the preceding conditions and then demonstrated its ap- -ion by solving the same number of problems that were solved by the peer models in those four conditions. The teacher did not

hesitate, make errors or verbalize achievement beliefs. This treatment controlled for the effects of modeled instruction included in the peer modeling conditions. To control for potential effects of making similarity judgments, these subjects judged how much the teacher was like their own teacher during mathematics. These similarity judgments otherwise are not important and will not be discussed further. Self-efficacy for learning was assessed as in the preceding conditions.

No model. These subjects received the training program (described below) but neither viewed videotapes nor judged perceived similarity. Self-efficacy for learning was assessed during a separate session after the pretest. This condition controlled for the effects of receiving subtraction training.

Training Sessions

The subtraction training program began on the day after subjects viewed the second videotape. During 40-minute sessions on five consecutive school days, all children worked on five sets of instructional materials that were ordered from least-to-most difficult as follows: regrouping once in two- and three-column problems, regrouping caused by a zero, regrouping twice, regrouping from a one, and regrouping across zeros (Friend & Burton, 1981). The format of each set was identical. The first page explained the relevant operations and portrayed two step-by-step worked examples. The next several pages each contained similar problems to solve. Each set included sufficient problems so that children could not finish it during the session.

At the start of each session, an adult proctor escorted 4-5 children to the training room and reviewed the explanatory page with this small group. If children indicated a lack of understanding, the proctor reviewed the relevant instruction again but did not supplement it. The proctor stressed the

importance of careful work, seated children at individual desks that were sufficiently separated from one another to preclude visual and auditory contact, and moved out of sight. Children solved problems alone and received no feedback on the accuracy of their work. If they were baffled on how to solve a problem they were free to consult the proctor who reviewed the troublesome operation.

Posttest

Subtraction self-efficacy, skill and persistence were assessed on the day following the last training session. The test instruments and procedures were identical to those of the pretest except that a parallel form of the skill test was used to eliminate possible problem familiarity.

For any given child, one proctor administered the pretest and posttest, one showed the two videotapes and administered the accompanying measures, and one monitored the five training sessions. Only the videotape proctor knew the child's treatment assignment. All measures and training materials were scored by an adult who was unaware of children's experimental assignments.

Results

Means and standard deviations of all measures are presented by experimental condition in Table 1. Preliminary analyses revealed no significant differences on any measure due to tester, school, or gender of child, nor any significant interactions among these variables or between them and treatment conditions. There also were no significant differences between experimental conditions on the pretest measures.

Insert Table 1 about here

Self-Efficacy for Learning

Self-efficacy for learning scores were analyzed with analysis of covariance using pretest self-efficacy as the covariate. The six treatment conditions constituted the treatment factor. ANCOVA yielded a significant treatment effect, $F(5, 65) = 18.13$, $p < .001$, $MS_e = 161.38$. Post hoc comparisons using the Scheffé method (Kirk, 1968) showed that the four peer model conditions (male mastery, male coping, female mastery, female coping) did not differ but that each judged self-efficacy higher than the teacher model ($p < .05$) and the no model ($p < .01$) conditions. Children in the teacher model condition made significantly ($p < .05$) higher self-efficacy judgments than subjects in the no model group.

Perceived Similarity

The two perceived similarity judgments of subjects in the four peer model conditions were compared using the t test for correlated scores (Winer, 1971). These analyses were nonsignificant; therefore, the two scores were averaged and analyzed with analysis of variance. ANOVA yielded a nonsignificant difference between conditions.

Posttest Measures

The posttest measures (self-efficacy, skill, persistence) were analyzed with a multivariate analysis of covariance using the three pretest measures as covariates. The six experimental conditions constituted the treatment factor. MANCOVA yielded a significant between-condition difference, Wilks' $\Lambda = .282$, $F(15, 168.8) = 6.54$, $p < .001$. Univariate F tests (ANCOVAs) yielded significant between-condition differences on posttest self-efficacy, $F(5, 65) = 14.09$, $p < .001$, $MS_e = 151.52$, and skill, $F(5, 65) = 16.77$, $p < .001$, $MS_e = 14.42$. Post hoc Scheffé comparisons on each measure revealed that the four

peer model conditions did not differ from one another but that each scored significantly higher than the teacher model ($p < .05$) and no model ($p < .01$) conditions. Subjects in the teacher model condition outperformed children assigned to the no model group, $p < .05$. Separate analyses on the set of 12 problems similar to those covered during the treatment and training sessions and on the set of 13 more complex problems yielded identical patterns of results.

Training Performance

To determine whether treatments differentially affected task motivation as measured by rate of problem solving during the training sessions, the total number of problems that children completed was analyzed with ANOVA. This analysis was significant, $F(5, 66) = 6.05$, $p < .001$, $MS_e = 189.53$. Post hoc comparisons showed that the five model conditions did not differ from one another but that each group completed significantly more problems than the no model condition (all $ps < .01$). Identical results were obtained using the proportion of problems that children solved correctly (i.e., number solved correctly divided by total number completed).

Correlational Analyses

Product moment-correlations were computed between self-efficacy for learning, perceived similarity (using data from the four peer model conditions), the three posttest measures (self-efficacy, skill, persistence), and training performance (number of problems completed). Initially, correlations were computed separately within each experimental condition. Because there were no significant between-condition differences in correlations of any measures, correlations were averaged across conditions using an r to z transformation (Edwards, 1976). These averaged correlations

are portrayed in Table 2.

Insert Table 2 about here

Self-efficacy for learning was positively related to posttest self-efficacy, posttest skill, and training performance (all *p*s $< .01$), but negatively to posttest persistence, $p < .05$. The more problems that children completed during training, the higher were their posttest efficacy judgments and skills, but the lower was their persistence (all *p*s $< .01$). Posttest self-efficacy bore a positive relationship to subsequent skill, $p < .01$. Persistence was negatively related to posttest self-efficacy ($p < .05$) and skill ($p < .01$). Correlations involving the perceived similarity measure yielded nonsignificant results. An identical pattern of results was obtained using the proportion of problems solved correctly as the measure of training performance.

Discussion

The present study supports the idea that modeling is an important influence on children's self-efficacy during cognitive skill acquisition. Modeling is often used to teach children skills, and the belief that one has learned a skill can raise self-efficacy (Rosenthal & Bandura, 1978; Schunk, 1984). Modeling also can raise self-efficacy because it implicitly conveys to observers that they are capable of performing the modeled operations (Schunk, 1984) This sense of efficacy is substantiated later when children successfully perform the task.

The obtained benefits of observing a peer model cannot be due to instructional factors because children in the teacher model condition observed

the same amount and type of instruction and problem solving. The present results demonstrate that similarity to models in personal attributes (i.e., age and gender) affects self-efficacy (Bandura, 1981). Modeling, which is a type of social comparison, can inform children about their own capabilities. Children who observe similar others perform a task are apt to believe that they can succeed as well and thereby experience higher self-efficacy (Bandura, 1981, 1982; Schunk, 1984).

The present results suggest that perceived similarity to models in competence also may influence children's self-efficacy during cognitive skill acquisition (Brown & Inouye, 1978; Schunk, 1984). Although subjects' perceptions of similarity in competence to the teacher model were not assessed, it is likely that they would have been lower than the obtained similarity judgments to the peer models. This is not to suggest that observing a teacher model necessarily exerts weak effects on children's self-efficacy. Students who typically learn more readily than the present subjects might have developed higher self-efficacy from observing a teacher model than did the present sample. Research needs to explore whether students' abilities moderate the effects of model characteristics on self-efficacy.

The obtained effects of observing peer models must be qualified before these results can be generalized to a classroom context. The present modeling was systematically designed to portray success, which should raise observers' self-efficacy. Although children observe many peer models in classrooms, the outcomes of classroom models' actions typically are more variable; that is, classroom peer models succeed and fail. Such variable effects might leave observers wondering whether they can perform well. In short, observation of

classroom peer models may not automatically raise self-efficacy.

The present results also must be qualified because the training program was designed to insure at least moderately successful performance. In their previous classroom experiences, the present subjects had experienced difficulties with regrouping and had not always succeeded after observing a peer or teacher model demonstrate subtraction skills. Higher self-efficacy brought about by observing a successful model will be influenced by one's subsequent performances (Bandura, 1977; Schunk, 1984); personal successes will substantiate this sense of self-efficacy whereas failures will lower it. Observation of successful classroom models does not guarantee that observers' self-efficacy for performing well will endure.

No difference was found on the perceived similarity measure due to the type of modeled behavior (mastery or coping). This negative finding is surprising, because it was expected that the subjects would view themselves more similar to the coping model than to the mastery model. Although the mastery and coping models acquired regrouping skills at different rates, they both succeeded at the task. Even though the present subjects' prior successes in subtraction were limited (e.g., problems without regrouping), children nonetheless had these experiences to draw on and may have concluded that if the peer model could learn to regroup they, too, could improve their skills. In contrast, therapeutic uses of coping models generally have involved fearful subjects (e.g., snake phobics) in threatening situations that have been fraught with failures (Thelen et al., 1979). It is possible that had an anxiety-provoking or even an unfamiliar task been employed in this study, subjects might have viewed the coping model's performance as more similar to their own while learning a new task. Greater perceived similarity to the

coping model might then have led to higher self efficacy for learning compared with the mastery model. This point requires empirical investigation.

That the mastery and coping models did not differentially affect the perceived similarity measure suggests that in judging similarity subjects focused more on what the models had in common (task success) than on their differences (e.g., rate of learning, number of errors, achievement beliefs). To help clarify the influence of perceived similarity on self-efficacy, future research might disentangle the effects of similarity in attributes from those due to similarity in competence, such as by using models of the opposite gender as subjects or by providing subjects with information on the model's competence relative to their own (i.e., higher, same, lower).

It is interesting that gender differences were not obtained on any measure. There is evidence that boys typically expect to perform better on mathematical tasks than girls (Deaux, 1976; Parsons, 1983); however, other research shows that girls may hold lower expectancies for success than boys on unfamiliar tasks or those that provide little information about personal capabilities, but that no gender differences emerge for familiar tasks or when tasks convey clear information about capabilities (Heller & Parsons, 1981; Lenney, 1977; Lenney & Gold, 1982; Schunk & Lilly, 1984). Given these considerations, the lack of gender differences does not seem surprising. Subjects were familiar with the task at the outset, and observing the videotapes provided further information about their capabilities for learning.

Contrary to Bandura's (1977, 1982) contention that as individuals develop self-efficacy and skills they should persist longer at tasks, no between-condition differences were obtained on the persistence measure, and posttest persistence was negatively correlated with self-efficacy for

learning, training performance, and posttest self-efficacy and skill. Previous research applying the self-efficacy model to children's achievement has shown that as children develop self-efficacy they persist longer at tasks and perform more skillfully (Schunk, 1981). Conversely, Schunk (1983) found a negative relationship between persistence and both self-efficacy and skill. As was the case in the Schunk (1983) study, the present results seem partly artifactual because children persisted for some time on pretest problems despite their low skills and instructions to decide how long to spend on each problem. Under these circumstances, children actually might spend less time solving problems on the posttest than they did on the pretest because in the intervening period they developed higher self-efficacy and skills. Persistence ought to bear a positive relationship to self-efficacy when the task is insolvable or appears sufficiently difficult such that students with low self-efficacy will quit readily whereas those who feel more competent will persevere because they believe they can master it (Bandura, 1982; Schunk, 1981, 1984).

Consistent with previous similar research (Schunk, 1981, 1983), this study supports the idea that self-efficacy is not merely a reflection of prior performances. Although the five model conditions did not differ in rate or accuracy of problem solving during training, children who previously had observed peer models subsequently judged self-efficacy higher than subjects who had been exposed only to the teacher model. The present results suggest that higher self-efficacy brought about by observing peer models was substantiated by children's actual performances during training and led to higher posttest skill. This study also shows that capability self-perceptions bear an important relationship to subsequent achievement. Personal

expectations for success are viewed as important influences on behavior by a variety of theoretical approaches (Bandura, 1982; Covington & Beery, 1976; Kukla, 1972; Schunk, 1984; Weiner, 1979, 1983).

Future research needs to examine the peer modeling process in greater detail to determine how children's self-efficacy is influenced by model characteristics and children's perceptions of models. Students are exposed to many peer models daily. Knowing what characteristics of peer models children attend to and use in forming self-efficacy judgments would have important theoretical and teaching implications. The present study suggests that teachers who systematically incorporate peer models into their instruction, at least with children who have skill deficiencies, may help to promote children's skills and self-efficacy for acquiring them.

References

Bandura, A. (1971). Analysis of modeling processes. In A. Bandura (Ed.), Psychological modeling (pp. 1-62). Chicago: Aldine-Atherton.

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. Psychological Review, 84, 191-215.

Bandura, A. (1981). Self-referent thought: A developmental analysis of self-efficacy. In J. H. Flavell & L. Ross (Eds.), Social cognitive development: Frontiers and possible futures (pp. 200-239). Cambridge, England: Cambridge University Press.

Bandura, A. (1982). Self-efficacy mechanism in human agency. American Psychologist, 37, 122-147.

Brown, I., Jr., & Inouye, D. K. (1978). Learned helplessness through modeling: The role of perceived similarity in competence. Journal of Personality and Social Psychology, 36, 900-908.

Covington, M. V., & Beery, R. G. (1976). Self-worth and school learning. New York: Holt, Rinehart & Winston.

Deaux, K. (1976). Sex: A perspective on the attribution process. In J. H. Harvey, W. J. Ickes, & R. F. Kidd (Eds.), New directions in attribution research (Vol. 1, pp. 335-352). Hillsdale, NJ: Erlbaum.

Edwards, A. L. (1976). An introduction to linear regression and correlation. San Francisco: Freeman.

Friend, J., & Burton, R. (1981). Teacher's guide: Diagnostic testing in arithmetic: Subtraction. Palo Alto, CA: Xerox Palo Alto Research Center.

Heller, K. A., & Parsons, J. E. (1981). Sex differences in teachers' evaluative feedback and students' expectancies for success in mathematics. Child Development, 52, 1015-1019.

Kazdin, A. E. (1974). Covert modeling, model similarity, and reduction of avoidance behavior. Behavior Therapy, 5, 325-340.

Kazdin, A. E. (1978). Covert modeling: The therapeutic application of imagined rehearsal. In J. L. Singer & K. S. Pope (Eds.), The power of human imagination: New methods in psychotherapy (pp. 255-278). New York: Plenum Press.

Kirk, R. E. (1968). Experimental design: Procedures for the behavioral sciences. Belmont, CA: Brooks/Cole.

Kornhaber, R. C., & Schroeder, H. E. (1975). Importance of model similarity on extinction of avoidance behavior in children. Journal of Consulting and Clinical Psychology, 43, 601-607.

Kukla, A. (1972). Foundations of an attributional theory of performance. Psychological Review, 79, 454-470.

Lenney, E. (1977). Women's self-confidence in achievement settings. Psychological Bulletin, 84, 1-13.

Lenney, E., & Gold, J. (1982). Sex differences in self-confidence: The effects of task completion and of comparison to competent others. Personality and Social Psychology Bulletin, 8, 74-80.

Maccoby, E. E., & Wilson, W. C. (1957). Identification and observational learning from films. Journal of Abnormal and Social Psychology, 55, 76-87.

Meichenbaum D. (1971). Examination of model characteristics in reducing avoidance behavior. Journal of Personality and Social Psychology, 17, 298-307.

Parsons, J. E. (1983). Expectancies, values, and acad... ...haviors. In J. T. Spence (Ed.), Achievement and achievement motives. Psychological and sociological approaches (pp. 75-146). San Francisco: Freeman.

Perry, M. A., & Furukawa, M. J. (1980). Modeling methods. In F. H. Kanfer & A. P. Goldstein (Eds.), Helping people change: A textbook of methods (2nd ed., pp. 131-171). New York: Pergamon Press.

Rosenthal, T. L., & Bandura, A. (1978). Psychological modeling: Theory and practice. In S. L. Garfield & A. E. Bergin (Eds.), Handbook of psychotherapy and behavior change: An empirical analysis (2nd ed., pp. 621-658). New York: Wiley.

Rosenthal, T. L., & Zimmerman, B. J. (1978). Social learning and cognition. New York: Academic Press.

Schunk, D. H. (1981). Modeling and attributional effects on children's achievement: A self-efficacy analysis. Journal of Educational Psychology, 73, 93-105.

Schunk, D. H. (1983). Ability versus effort attributional feedback: Differential effects on self-efficacy and achievement. Journal of Educational Psychology, 75, 848-856.

Schunk, D. H. (1984). Self-efficacy perspective on achievement behavior. Educational Psychologist, 19, 48-58.

Schunk, D. H., & Lilly, M. W. (1984). Sex differences in self-efficacy and attributions: Influence of performance feedback. Journal of Early Adolescence, 4, 203-213.

Thelen, M. H., Fry, R. A., Fehrenbach, P. A., & Frautschi, N. M. (1979). Therapeutic videotape and film modeling: A review. Psychological Bulletin, 86, 701-720.

Weiner, B. (1979). A theory of motivation for some classroom experiences. Journal of Educational Psychology, 71, 3-25.

Weiner, B. (1983). Some methodological pitfalls in attributional research. Journal of Educational Psychology, 75, 530-543.

Winer, B. J. (1971). Statistical principles in experimental design (2nd ed.). New York: McGraw-Hill.

Zimmerman, B. J., & Ringle, J. (1981). Effects of model persistence and statements of confidence on children's self-efficacy and problem solving. Journal of Educational Psychology, 73, 485-493.

Footnote

[1]The terms mastery model and coping model are derived from therapeutic contexts, in which modeled mastery and coping behaviors are used to help reduce avoidance behaviors in fearful clients. Mastery models typically demonstrate fearless approach behaviors and physical contact with the feared object (e.g., a snake), whereas coping models initially demonstrate apprehension but gradually overcome the fear by inhibiting or reinterpreting their negative thoughts and by displaying coping behaviors (e.g., taking deep breaths) (Meichenbaum, 1971). Coping models need not demonstrate complete mastery, because the coping efforts are primarily directed toward coping with fears. Given these considerations, use of the term coping model in the present study may be somewhat problematic, because the model did not demonstrate fears but eventually performed as well as the mastery model. The key distinctions between the mastery and coping models employed in the present research involve rate of learning, number of errors, and type of achievement beliefs.

Table 1

Descriptive Statistics - Means (and Standard Deviations)

for Various Measures as a Function of Experimental Condition

Measure	Phase	Male Mastery	Male Coping	Female Mastery	Female Coping	Teacher Model	No Model
Self-Efficacy for Learning (Average judgment per problem; 10 (low) - 100)	---	93.0 (12.5)	91.9 (8.5)	90.1 (7.6)	91.4 (16.2)	72.1 (18.9)	54.3 (12.9)
Perceived Similarity (Average judgment per videotape; 0 (low) - 100)	---	90.0 (14.8)	68.2 (20.1)	70.5 (19.3)	58.2 (34.4)	---	---
Self-Efficacy (Average judgment per problem; 10 (low) - 100)	Pretest	46.5 (12.5)	45.6 (19.4)	42.3 (20.1)	42.0 (15.1)	45.8 (20.5)	43.9 (16.8)
	Posttest	90.6 (11.2)	91.6 (8.9)	91.6 (6.8)	91.5 (15.5)	77.2 (13.7)	60.9 (15.3)
Skill (Number of correct solutions on 25 problems)	Pretest	4.8 (2.8)	4.6 (3.1)	4.5 (3.5)	4.6 (2.9)	4.9 (3.8)	4.6 (3.5)
	Posttest	19.1 (4.2)	18.8 (5.1)	18.9 (3.6)	18.9 (4.1)	13.5 (5.7)	8.3 (3.8)
Persistence (Average number of sec per problem)	Pretest	26.0 (5.9)	23.4 (7.5)	33.3 (10.1)	29.5 (10.1)	30.0 (9.2)	28.9 (9.5)
	Posttest	20.8 (4.7)	27.4 (13.0)	24.2 (7.0)	27.5 (7.4)	30.1 (10.1)	27.5 (7.5)
Training Performance (Number of problems completed)	---	164.7 (6.2)	159.3 (14.7)	164.7 (8.5)	163.3 (9.7)	163.3 (7.1)	139.6 (25.8)

Note. N = 72; n per condition = 12.

Table 2

Correlations Between Experimental Measures

Measure	2	3	4	5	6
1. Self-Efficacy for Learning	.06	.90**	.66**	-.24*	.42**
2. Similarity	—	-.02	.01	-.16	-.12
3. Self-Efficacy[a]		—	.73**	-.29*	.49**
4. Skill[a]			—	-.31**	.50**
5. Persistence[a]				—	-.38**
6. Training Performance					—

Note. $N = 72$; $N = 48$ for correlations involving the similarity measure.

[a]Posttest measure.

$^{*}p < .05$. $^{**}p < .01$.