Peer Models : Influence on Children's Self-Efficacy and Achievement

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Schunk, D. H., & Hanson, A. R. (1985). Peer models: Influence on children's self-efficacy and achievement. *Journal of Educational Psychology, 77,* 313-322.

Abstract:
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).

Article:
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, little research exists 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 s) 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., sex, 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 are likely to view the teacher as vastly superior in competence. Models of the same sex 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 grasping subtraction operations that involved regrouping. Subjects viewed videotapes of an adult teacher providing subtraction instruction to a child model of the same sex and age as themselves, 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 approximately 25% of the problems. We chose this selection procedure because our 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 thought that the peer model and coping model treatments would appear more credible to those 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: absences (3 children), being shown the incorrect videotapes (1 child), and random exclusion from the appropriate cells to equalize cell sizes (4 children).

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 approximately 2 s 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 two to four 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 sex 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 sex as themselves (Bandura, 1971; Maccoby & Wilson, 1957) and because the purpose of this study was not to investigate cross-sex 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 on 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; the second tape covered the second three. Videotapes were used rather than live modeling to ensure 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" and "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.

Female mastery model

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

Female coping model

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.

Teacher model

Videotapes shown to these subjects portrayed only the teacher. During each 15-min block, the teacher first explained the appropriate regrouping operation as in the preceding conditions and then demonstrated its application 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 are not 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-min sessions on 5 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 formats of the sets were identical. The first page explained the relevant operations and portrayed two step-by-step worked-out 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.

Table 1
Means and Standard Deviations for Various Measures as a Function of Experimental Condition

	Experimental condition											
	Male mastery		Male coping		Female mastery		Female coping		Teacher model		No model	
Measure	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Self-efficacy for learning (Avrg. judg. per prob.; 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 (Avrg. judg. per videotape; 0[low]–100)	90.0	14.8	68.2	20.1	70.5	19.3	58.2	34.4	—			—
Self-efficacy (Avrg. judg. per prob.; 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 (No. of correct solutions on 25 prob.)												
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 (Avrg. no. of s per prob.)												
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 (No. of prob. 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. Avrg. = average; judg. = judgment; prob. = problem.

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 sex 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.

Self-Efficacy for Learning

Self-efficacy-for-learning scores were subjected to an analysis of covariance (ANCOVA) using pretest self-efficacy as the covariate. The six treatment conditions constituted the treatment factor. The ANCOVA yielded a significant treatment effect, $F(5, 65) = 18.13$, $p < .001$, $MS_e (65) = 161.38$. 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 subjects in each condition judged self-efficacy higher than subjects in 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 in an analysis of variance (ANOVA), which yielded a nonsignificant difference between conditions.

Posttest Measures

The posttest measures (self-efficacy, skill, persistence) were analyzed with a multivariate analysis of covariance (MANCOVA) using the three pretest measures as covariates. The six experimental conditions constituted the treatment factor. The MANCOVA yielded a significant between-conditions difference, Wilks's lambda = .282, $F(15, 168.8) = 6.54$, $p < .001$. Univariate F tests (ANCOVA s) yielded significant between-conditions differences on posttest self-efficacy, $F(5, 65) = 14.09$, $p < .001$, $MS_e (65) = 151.52$, and skill, $F(5, 65) = 16.77$, $p < .001$, $MS_e (65) = 14.42$. Post hoc Scheffé comparisons on each measure revealed that the four peer model conditions did not differ from one another but that subjects in each condition scored significantly higher than those in 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 an ANOVA. This analysis was significant, $F(5, 66) = 6.05$, $p < .001$, $MS_e (66) = 189.53$. 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 no significant between-conditions differences existed in correlations of any measures, correlations were averaged across conditions using an r to z transformation (Edwards, 1976). These averaged correlations are presented in Table 2.

Table 2
Correlations Between Experimental Measures

Measure	2	3	4	5	6
1. Self-efficacy for learning	.06	.90**	.66**	−.24*	.42**
2. Perceived 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.
* $p < .05$. ** $p < .01$.

Self-efficacy for learning was positively related to posttest self-efficacy, posttest skill, and training performance (all $ps < .01$), 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 $ps < .01$). Posttest self-efficacy bore a positive relation 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 sex) 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 in competence to models 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 is needed 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 the classroom. 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 ensure 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 is influenced by one's subsequent performances (Bandura, 1977; Schunk, 1984); personal successes substantiate this sense of self-efficacy, whereas failures lower it. Observation of successful classroom models does not guarantee that observers' self-efficacy for performing well will endure.

No difference was found on perceived similarity 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 as 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 sex 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 sex 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 sex 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 sex 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-conditions 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 relation 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 be positively related to self-efficacy when the task is insolvable or appears sufficiently difficult 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), the present 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 relation 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 is needed 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.

Footnotes

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, such as 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 used in the present research involve rate of learning, number of errors, and type of achievement beliefs.

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