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ABSTRACT

Examined were the ways peer models affect children's self-efficacy in a cognitive learning context and whether the effects of models vary depending on the sex of the subjects. Subjects were 72 fourth and fifth grade students low in subtraction skills. During pretests subjects indicated the extent to which they thought ability, effort, task characteristics, and luck helped them solve problems correctly; judged their capacity to solve different types of problems; and completed a skills test. Subjects were randomly assigned to one of six experimental conditions: male mastery model, male coping model, female mastery model, female coping model, teacher model, and instructional control (no model). All children in the five model conditions received two, 45-minute treatment sessions over consecutive school days. During the sessions, they observed two videotapes presenting models posing and solving subtraction problems; tapes including peer models differed in sex of model, problem solving behaviors, and verbalizations of achievement beliefs and self-efficacy. Subjects then received 40 minutes of subtraction training and practice for 5 days. Posttests similar to pretests were administered. Results suggest that teachers who incorporate peer models into their classroom instruction may help to promote children's skills and self-efficacy for mastering the skills. Neither type of peer model nor sex of subject significantly affected self-efficacy for learning. Both boys and girls judged themselves more similar to the mastery than to the coping model; for each type of model, boys made higher similarity judgments than girls. (RH)

Project Report

Self-Efficacy Induction through Modeling

Dale H. Schunk

The primary purpose of this research was to investigate how peer models affect children's self-efficacy in a cognitive learning context. A secondary purpose was to determine whether the effects of models vary depending on the sex of the subjects. The rationale, background, and hypotheses of this study are described in Schunk (1983) and will not be reiterated here.

Method

Subjects

Subjects were 72 students drawn from grades four and five in two schools. Because this research focused on processes whereby skills and self-efficacy could be developed when they initially were low, children's teachers were shown the subtraction skill test and nominated children who they felt could not solve more than about 25-30% of the problems. These students were individually administered the pretest by an adult tester.

Pretest

Attributions. Attributions, or perceived causes of outcomes, were assessed because they are hypothesized to be important cues for assessing performance expectancies (i.e., self-efficacy) in cognitive skill contexts (Bandura, 1977, 1982; Schunk, 1984a, 1984b; Weiner, 1979, 1983). Four scales were shown on a sheet of paper. Each scale ranged in intervals of 10 from "not at all" (0), to "a whole lot" (100). The four scales were labeled "good at it" (i.e., ability), "worked hard" (effort), "easy problems" (task), and "lucky" (luck). These four causes are common attributions in achievement contexts (Weiner, 1979). Label order was counterbalanced across subjects.

The tester explained that this paper showed four things that can help students solve problems. The tester described the scale and each of the attributions, and provided examples of how hypothetical students might mark the scales. Students were asked to think about times when they had done well in arithmetic (e.g., solved a lot of problems correctly, received a high score on a test). They were advised to mark how much they thought each factor helped them to perform well, and that their marks did not have to add to a certain number (e.g., 100). This instrument has been used in previous research by the principal investigator (Schunk, in press); students readily understand the instructions and scales.

Self-efficacy. Immediately following the attributional assessment, self-efficacy for solving subtraction problems correctly was measured following procedures of previous research (Bandura & Schunk, 1981; Schunk, 1981, 1982, in press). The efficacy scale ranged from 10 to 100 in 10-unit intervals from high uncertainty (10), to complete certitude (100). Students initially received practice by judging their certainty of successfully jumping progressively longer distances. In this concrete fashion, students learned the meaning of the scale's direction and the different numerical values.

Following this practice, students were shown 25 sample pairs of subtraction problems for a few seconds 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 but involved different numbers. Subjects judged their capability to solve different types of problems and not whether they could solve any particular problem. Subjects made their judgments privately by circling an efficacy value. They were advised to be honest and mark how much they really felt. Self-efficacy scores were summed and averaged.

Subtraction skill and persistence. The skill test was administered immediately after the efficacy assessment and included 25 subtraction problems ranging from two to six columns. Each problem tapped one of the following operations: regrouping once, regrouping caused by a zeros, regrouping twice, regrouping from a one, and regrouping across zeros. Of these 25 problems, 12 were similar in form and operations required to some of the problems that children solved during the subsequent training sessions; to assess generalization, the other 13 were more complex. For example, during training children solved problems requiring 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 problems one at a time and verbally instructed children to examine each problem, decide how long they wanted to spend on it, and turn each page over when they finished working on it. Children were given no performance feedback on the accuracy of their solutions. The tester also recorded the amount of time children spent on each problem. These persistence scores were summed and averaged.

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, instructional control (no model). Only boys were assigned to the first two conditions, whereas only girls were assigned to the second two conditions. This assignment procedure was followed because the purpose of this study was not to investigate cross-sex modeling, and there is evidence that children may attend more closely to same-sex models (Maccoby & Wilson, 1957). 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-minute treatment sessions over consecutive school days, during which they observed two videotapes that presented the following subtraction operations in 15-minute 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 shown rather than live modeling to insure standardized presentations across subjects. A female teacher was used because most elementary teachers in the Houston area are women. The peer models were fifth graders. The teacher and models were unfamiliar to subjects. All work was conducted at a chalkboard to permit easier viewing.

Male mastery model. The first videotape shown to subjects assigned to this condition initially portrayed the teacher explaining and demonstrating how to regroup once in two-column problems. Following this brief (2-3 minute) demonstration, the teacher wrote a comparable problem on the board for the model to solve. The model performed all operations correctly. While solving the problem the model verbalized aloud the problem-solving operations, along with positive achievement beliefs that included high self-efficacy ("I can do that one"), high ability ("I'm good at this"), low task difficulty ("That was 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. This sequence continued for the remainder of the 15-minute block. The model verbalized two different achievement beliefs while solving each problem. On completion of each 15-minute block, the teacher explained and demonstrated how to solve the next type of problem, after which the model was given problems to solve.

After viewing each videotape, subjects were asked to think about the boy in the tape and judge how much they were like the boy in math. This 10-unit perceived similarity in competence scale ranged from "not at all" (0), to "a whole lot" (100); judgments from the two sessions were averaged. Perceived similarity was assessed to clarify how modeling affects self-efficacy. Coping models, for example, could affect self-efficacy due to their perceived similarity by observers or due to the coping skills they convey (Kornhaber & Schroeder, 1975; Meichenbaum, 1971). 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 how certain they were that they could solve them.

Male coping model. The 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 male peer model. During the first tape, the model occasionally made errors (e.g., forgot to decrease the tens column by one, subtracted incorrectly) or was unsure of what to do. When hesitations or errors occurred, the model was prompted by the teacher concerning the relevant operation, after which the model performed correctly. The model also verbalized two achievement beliefs per problem, but initially these reflected low self-efficacy ("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 ("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 end of the first tape he no longer made errors or hesitated. As the second tape progressed, the model displayed accurate problem-solving behaviors and verbalized positive achievement beliefs, as in the mastery model condition. Subjects assigned to this condition completed the perceived similarity in competence 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 the peer model was a girl. 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-minute block, the teacher explained the appropriate subtraction operation and demonstrated its application by solving problems. The teacher solved the same number of problems as the peer models in the preceding conditions, but did not demonstrate 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. Self-efficacy for learning was assessed as in the preceding conditions.

Instructional control (no model). These subjects received the training program (described below) but did not view videotapes and did not judge 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

Following the showing of videotapes, all subjects participated in a subtraction training program that included instruction and practice opportunities. During 40-minute sessions on five consecutive school days, children worked on five sets of instructional materials that were ordered from least-to-most difficult as follows: regrouping once in 2- and 3-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 operation 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, and then seated children at individual desks that were sufficiently separated from one another to preclude visual and auditory contact. The proctor retired to an out-of-sight location. Children solved problems alone and received no feedback on the accuracy of their solutions; however, they could consult the proctor if they were baffled on how to solve problems.

Posttest

The attributional assessment was re-administered to all subjects on the day after the last (fifth) training session. It was identical to that of the pretest except that subjects were asked to think about their work during the training sessions and mark how much they thought each factor helped them solve problems. Subtraction self-efficacy, skill and persistence were assessed on the day following the attributional assessment. The instruments and procedures were similar to those of the pretest except that a parallel form of the skill test was used to eliminate possible problem familiarity.

Results

Preliminary analyses on each measure revealed no significant differences due to tester or school, nor any significant interactions between these variables and treatment conditions. Data were therefore pooled across these variables. Self-efficacy for learning and the posttest measures (attributions, self-efficacy, skill, persistence) were analyzed with analysis of covariance (ANCOVA) using the corresponding pretest measure as the covariate. The six treatment conditions constituted the treatment factor.

ANCOVA yielded a significant treatment effect on self-efficacy for learning. The four peer modeling conditions did not differ, but each made higher efficacy judgments than the teacher model and the no model conditions. Teacher model subjects judged self-efficacy for learning higher than children in the no model condition. ANCOVA also yielded a significant treatment effect on posttest ability attributions, self-efficacy and skill. The four peer model conditions did not differ, but each scored higher on these three measures than the other two conditions. Teacher model subjects demonstrated higher self-efficacy and skill than no model children. ANCOVA of posttest persistence yielded a nonsignificant result.

To determine whether treatments differentially affected task motivation, the number of problems that children solved during training was analyzed with analysis of variance (ANOVA). ANOVA yielded a significant treatment effect. The five model conditions did not differ, but each solved more problems than the no model condition. More rapid problem solving was not attained at the expense of accuracy, because similar results were obtained using the proportion of problems solved correctly (i.e., the number of problems solved correctly divided by the total number attempted).

ANOVA applied to the perceived similarity measure, using the four peer model conditions as the treatment factor, was statistically significant. Subjects in the male mastery model condition judged similarity higher than children in the other three conditions. The male coping model and female mastery model conditions did not differ, but each judged similiarity higher than the female coping model condition.

Discussion

The expected benefit of peer models on self-efficacy for learning was obtained. In turn, higher self-efficacy for learning led to higher self-efficacy and subtraction skill on the posttest. Observation of the teacher model also enhanced these outcomes compared with not observing a model. The idea that self-efficacy is not merely a reflection of prior performance outcomes also was supported (Bandura, 1977, 1982; Schunk, 1984a, 1984b). Although children in the five modeling conditions did not differ in their rate or accuracy of problem solving during training, children who previously had observed peer models judged self-efficacy higher on the posttest.

No differences in self-efficacy for learning were obtained due to type of peer model (mastery or coping) or to sex of subject. These negative findings suggest that the most important characteristic was that the model was a same-sex peer. These findings may have resulted in part because a familiar task (subtraction) was used. Although the subjects had experienced difficulties with subtraction in their classes, they also had encountered some success (i.e., problems not requiring regrouping). Observing a peer model master the task, whether rapidly or gradually, apparently was sufficient to convince them that they could as well. Perhaps if an unfamiliar task has been used, children might have viewed the coping model's performance as more representative of their own performances while learning a new task, which might have led to higher self-efficacy for learning compared with the mastery model.

Analysis of the perceived similarity in competence measure showed that both boys and girls judged themselves more similar to the mastery than to the coping model, and that for each type of model (mastery, coping), boys made higher similarity judgments than girls. The former finding may have resulted in part from task familiarity. It is possible that coping model subjects noted the early deficiencies of the model, and given their familiarity with subtraction, may have felt that they would not make the same types of mistakes. The latter finding may be reflective of the sex difference often obtained on mathematical self-perception measures (Deaux, 1976). Although there are some exceptions, research shows that boys typically expect to perform better in mathematics than do girls (Deaux, 1976; Heller & Parsons, 1981). To the extent that the present subjects held these beliefs, it is not surprising that boys judged themselves more similar to each type of model because both models mastered the task.

Future research needs to examine the peer modeling process in greater detail to determine how model characteristics influence subjects' self-efficacy and perceived similarity, and how perceived similarity relates to self-efficacy for learning. Children in school 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 theoretical and teaching implications. The present results suggest that teachers who incorporate peer models into their classroom instruction, at least with children who have encountered previous learning difficulties, may help to promote children's skills and self-efficacy for mastering them.

References

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

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

Bandura, A., & Schunk, D. H. (1981). Cultivating competence, self-efficacy, and intrinsic interest through proximal self-motivation. Journal of Personality and Social Psychology, 41, 586-598.

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.

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.

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.

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.

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. (1982). Effects of effort attributional feedback on children's perceived self-efficacy and achievement. Journal of Educational Psychology, 74, 548-556.

Schunk, D. H. (1983). Self-efficacy induction through modeling. Unpublished manuscript, University of Houston. (Submitted as a grant proposal to The Spencer Foundation).

Schunk, D. H. (1984a, April). Self-efficacy and classroom learning. Paper presented at the meeting of the American Educational Research Association, New Orleans.

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

Schunk, D. H. (in press). Sequential attributional feedback and children's achievement behaviors. Journal of Educational Psychology.

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.