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Goal and Self-Evaluative Influences During Children's Cognitive Skill Learning

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Two studies investigated how goals and self-evaluation affect motivation and achievement outcomes. In both studies, fourth-grade students received instruction and practice on fractions over sessions. Students worked under conditions involving either a goal of learning how to solve problems (learning goal) or a goal of merely solving them (performance goal). In Study 1, half of the students in each goal condition evaluated their problem-solving capabilities. The learning goal with or without self-evaluation and the performance goal with self-evaluation led to higher self-efficacy, skill, motivation, and task orientation than did the performance goal without self-evaluation. In Study 2, all students in each goal condition evaluated their progress in skill acquisition. The learning goal led to higher motivation and achievement outcomes than did the performance goal. Research suggestions and implications for educational practice are discussed.

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A topic assuming increasing educational importance is learners' *self-regulation* of their cognitions, motivation, and behaviors to promote academic achievement (Zimmerman, 1989, 1990, 1994). Self-regulation involves self-observation, self-judgment, and self-reaction. Self-observation refers to deliberate attention to aspects of one's behavior to include their determinants and effects. Self-judgment entails comparing one's present performance level with one's goal to determine progress. Self-reaction refers to people's assessments of their performances (e.g., acceptable, unsatisfactory) (Bandura, 1986, 1991b; Schunk, 1990).

This conceptualization postulates a central mediating role for perceptions of *self-efficacy* or personal beliefs about one's capabilities to learn or perform skills at designated levels. Learners acquire information to appraise self-efficacy from their performances, vicarious (observational) experiences, forms of persuasion, and physiological reactions (e.g., sweating, heart rate). Students who feel efficacious about learning choose to engage in tasks, select effective strategies, expend effort, and persist when difficulties are encountered (Bandura, 1989; Schunk, 1991; Zimmerman, 1989). In turn, these self-regulatory activities affect self-efficacy. As students work on tasks, they observe their performances, compare them with their goals, and judge their progress. Positive assessments enhance self-efficacy and motivation (Bandura, 1991a, 1993).

This article describes two research studies that were conducted in sequence. The general purpose of these studies was to explore the operation of self-regulatory processes among children during cognitive skill learning. The conceptual focus, relevant research, research questions, and hypotheses for the first study are discussed in this section. The rationale and hypotheses for Study 2 are presented later in this article at the start of the Study 2 section.

The first study determined the effects of providing students with goals denoting learning or performance outcomes and examined the effects of self-evaluative processes. Goals provide standards against which people compare their present performances (Bandura, 1986; Locke & Latham, 1990). When students adopt a goal, they may experience a sense of efficacy for attaining it, which motivates them to engage in appropriate activities, attend to instruction, persist, and expend effort. Students' initial self-efficacy is substantiated as they observe their goal progress because perceptions of progress convey they are becoming skillful. Self-efficacy sustains motivation and leads learners to establish new goals when they master their present ones (Bandura, 1988; Schunk, 1991). This process is illustrated in Figure 1a.

The effects of goals depend on the properties of specificity, proximity, and difficulty (Bandura, 1988; Locke, Shaw, Saari, & Latham, 1981). Goals that incorporate specific performance standards, are close at hand, and are moderately difficult are more likely to enhance performance than goals that are general, extend into the distant future, or are perceived as overly easy or difficult (Locke & Latham, 1990; Schunk, 1990, 1991). Goal effects also may depend on whether the goal denotes a learning or performance outcome (Meece, 1991). A *learning goal* refers to what knowledge and skills students are to acquire; a *performance goal* denotes what task students are to complete (Dweck & Leggett, 1988). Goal setting research typically has focused on such goals as rate or quantity of performance, but educators increasingly are advocating greater emphasis on learning processes and strategies (Weinstein, Goetz, & Alexander, 1988).

The first study tested the idea that learning and performance goals exert different effects on motivation and achievement outcomes even when their goal properties are similar (Schunk & Swartz, 1993a, 1993b). As shown in Figure 1b, learning goals focus students' attention on processes and strategies that help them acquire capabilities and improve their skills (Ames, 1992). Students who pursue a learning goal are apt to experience a sense of self-efficacy for attaining it and be motivated to engage in task-appropriate activities (e.g., expend effort, persist, use effective strategies) (Bandura, 1986; Schunk, 1989). Learners' self-efficacy is substantiated as they work on the task and assess their progress (Wentzel, 1992). Perceived progress in skill

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        a

                                                     PERCEIVED    SKILLFUL
GOALS --> SELF-EFFICACY --> MOTIVATION -->                   -->
                                                     PROGRESS     PERFORMANCE


        b

LEARNING                        MOTIVATION       PERCEIVED       ACHIEVEMENT
         --> SELF-EFFICACY -->                -->             -->
  GOAL                        SELF-REGULATION    PROGRESS         GAINS


        c

PERFORMANCE         TASK
            -->               --> SOCIAL COMPARISONS --> ABILITY ASSESSMENT
  GOAL           ENGAGEMENT
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Figure 1. **(a) Process whereby goals and self-efficacy affect motivation and skillful performance; (b) hypothesized operation of learning goals in achievement contexts; (c) hypothesized operation of performance goals in achievement contexts**

acquisition and a sense of self-efficacy for continued learning sustain self-regulatory activities and enhance skillful performance (Schunk, 1991).

In contrast, performance goals focus students' attention on completing tasks (Figure 1c). Such goals may not highlight the importance of the processes and strategies underlying task completion or raise self-efficacy for acquiring skills (Schunk & Swartz, 1993a, 1993b). As students work on the tasks, they may not compare their present and past performances to determine progress. Performance goals can lead to one's socially comparing one's work with that of others to determine progress. Social comparisons can result in low perceptions of ability among students who experience difficulties, which adversely affects task motivation (Ames, 1992; Jagacinski, 1992).

Research testing these ideas has yielded mixed evidence. Meece, Blumenfeld, and Hoyle (1988) assessed goal orientations, intrinsic motivation to learn, and cognitive engagement patterns, during science lessons. Students who emphasized task-mastery (analogous to learning goals) reported more active cognitive engagement characterized by self-regulatory activities (e.g., review material not understood). Intrinsic motivation related positively to goals stressing learning and understanding.

Elliott and Dweck (1988) gave children feedback indicating they had high or low ability and instructions highlighting a learning goal of developing competence or a performance goal of appearing competent. The learning goal led to a mastery motivational pattern: Children sought to increase competence by choosing challenging tasks and using effective problem-solving strategies. Children given the performance goal and high-ability feedback persisted at the task but also avoided challenging tasks that might have entailed public errors. Performance-goal children who received low-ability feedback selected easier tasks, did not persist to overcome mistakes, and displayed negative affect.

During reading comprehension instruction, Schunk and Rice (1989) found that, with children deficient in reading skills, a process goal (learning to use a comprehension strategy) and a product goal (answering questions) led to higher self-efficacy than did a general goal of working productively; however, the process and product conditions did not differ. Schunk and Rice (1991) found that combining a process goal with feedback on progress toward the goal of learning to use a strategy promotes self-efficacy and skill better than process and product goal conditions. These two studies suggest that without progress feedback learning goals are not more effective than performance goals among students with reading problems.

Schunk and Swartz (1993a, 1993b) provided children in regular and gifted classes with a process goal of learning to use a paragraph-writing strategy or a product (performance) goal of writing paragraphs. Half of the process-goal students periodically received feedback on their progress in learning the strategy. Although Schunk and Swartz (1993b) found on a few measures that the process goal with feedback was more effective than the process goal without feedback, the results of these studies generally showed that the process goal with or without progress feedback led to higher achievement outcomes than the product goal and that the effects of the two process goal conditions were comparable.

The preceding inconsistencies are difficult to resolve because these studies differ in type of subjects, experimental content, and instructional format. One possibility is that average achievers are able to assess their learning progress better than remedial students, so differential effects of learning and performance goals may be more probable among average achievers. Other research shows that children with cognitive deficiencies have difficulty determining how well they are using a strategy (Borkowski & Buechel, 1983) and may not derive reliable competency information on their own (Licht & Kistner, 1986).

Study 1 examined the effects of learning and performance goals as children acquired mathematical fraction skills. There is little research on the operation of learning and performance goals during mathematics learning. Many students find mathematics difficult and doubt their capabilities to perform well (Stipek & Gralinski, 1991). Providing students with a learning goal, instruction, and practice on problem-solving strategies would seem to be an effective means for enhancing their self-efficacy, skills, learning goal orientation, and self-regulatory activities (Schunk, 1991). It was hypothesized that learning goals would lead to higher achievement outcomes than performance goals because the former goals emphasized progress in skill acquisition and the importance of strategies for improving skills.

This study also tested the hypothesis that self-evaluations of capabilities influence motivation and achievement outcomes. The self-evaluation process comprises both self-judgments of present performance by comparing it to one's goal and self-reactions to those judgments by deeming performance noteworthy, unacceptable, and so forth. Positive self-evaluations lead students to feel efficacious about learning and motivated to continue to work diligently because they believe they are capable of making further progress (Schunk, 1991). Low self-judgments of progress and negative self-reactions will not necessarily diminish self-efficacy and motivation if students believe they are capable of succeeding but that their present approach is ineffective (Bandura, 1986). Such students may alter their self-regulatory processes by working harder, persisting longer, adopting what they believe is a better strategy, or seeking help from teachers and peers (Schunk, 1990). These and other self-regulatory activities are likely to lead to success (Zimmerman & Martinez-Pons, 1992).

Research has not investigated how self-evaluations of capabilities during cognitive skill learning affect children's achievement outcomes, although other evidence provides indirect support for the preceding ideas. Research with children during learning of mathematical skills (Schunk & Hanson, 1985; Schunk, Hanson, & Cox, 1987) and writing skills (Schunk & Swartz, 1993a, 1993b) shows that measures of self-efficacy for learning or improving skills collected prior to receiving instruction predict subsequent motivation and skill acquisition. Masters and Santrock (1976) found that preschool children who verbalized self-judgmental statements during performance of an effortful handle-turning task (e.g., "I'm really good at this") persisted longer than children who verbalized self-critical or neutral statements.

Bandura and Cervone (1983) obtained benefits of goals and self-evaluative feedback. College students pursued a goal of increasing motor-skill performance by 40% over baseline; others were given feedback indicating they increased performance by 24%, and those in a third condition received goals and feedback. Goals plus evaluative feedback had the strongest effect on performance and self-efficacy for goal attainment, which predicted subsequent effort. Bandura and Cervone (1986) gave subjects a goal of 50% improvement and false feedback indicating they achieved an increase of 24%, 36%, 46%, or 54%. Self-efficacy was lowest for the large substandard discrepancy (24%) and highest for the small suprastandard discrepancy (54%). Subjects then indicated goals for the next session and performed the task. Effort was positively related to self-set goals and self-efficacy across conditions. A measure of self-evaluation (self-satisfaction with performance) showed that the greater the dissatisfaction and the higher the self-efficacy the stronger was the subsequent effort expenditure.

In the first study, it was hypothesized that self-evaluations of capabilities would positively affect motivation, self-efficacy, learning goal orientation, and skills. It also was hypothesized that combining learning goals with self-evaluations would prove most effective. To the extent that learning goals produce a focus on skill improvement, self-evaluations should complement this focus and highlight that students are making progress in acquiring skills. If students who receive performance goals do not develop a similar focus on skill improvement, self-evaluations of capabilities will not complement the goal or enhance motivation and self-efficacy for further learning.

Study 1—Method

Subjects

The final sample included 44 fourth-grade students drawn from two classes in one elementary school. The 18 girls and 26 boys ranged in age from 9 years, 1 month, to 10 years, 10 months (M = 9 years, 10 months). Although different socioeconomic backgrounds were represented, children predominantly were middle class. Ethnic composition was 24 White and 20 African-American students. Initially all 46 students in the two classes participated, but one student was dropped from the study because he missed some instructional sessions, and another was dropped to equalize cell sizes. Students received mathematics instruction in regular classes and school personnel considered them to be average achievers.

Pretest

The pretest was administered by a tester from outside the school. It comprised measures of goal orientation, self-efficacy, skill, and persistence.

Goal orientation. Goal orientations (sets of behavioral intentions that influence how students approach and engage in learning activities) were assessed to determine if the goal and self-evaluation conditions exert differential effects on students' propensities toward various classroom goals. The goal orientation inventory included 18 items adapted from Meece et al. (1988). Each item tapped one of four goal orientations (number of items and sample item in parentheses): *task*—desire to independently master and understand academic work (5 items, "I want to do better than I have done before"); *ego*—desire to perform well to please the teacher and avoid trouble (4 items, "I want the teacher to think I am doing a good job"); *affiliative*—desire to share ideas and work with peers (4 items, "I want to work with my friends"); *work avoidant*—desire to accomplish academic work with minimum effort (5 items, "I want to do as little work as possible"). Children decided how well each item described how they usually felt during mathematics and judged it on a 10-point scale ranging from *not at all* (10) to *very much* (100). The items tapping each orientation were averaged; four scores are included in the data analyses. Reliability was assessed during a pilot study with 10 children who were comparable to the present sample but who did not participate in the study. Children completed the instrument twice, 2 weeks apart. Test-retest coefficients were: .82 (task), .75 (ego), .77 (affiliative), .71 (work avoidant). Some of these coefficients are not high, which suggests that the present students may have experienced some difficulty comprehending the instrument. Readers should interpret the goal orientation results with some caution.

Self-efficacy. The self-efficacy test assessed children's perceived capabilities for correctly solving types of fraction problems (Schunk et al., 1987). The scale ranged in 10-unit intervals from *not sure* (10) to *really sure* (100). There were 31 pairs of problems. The two problems constituting each pair were similar in form and operations required and corresponded to one problem on the skill test although they involved different numbers. The reliability of the efficacy test was assessed during the pilot study; test-retest $r = .81$.

Children received practice using the self-efficacy scale and then were shown briefly each pair of problems for about 2 seconds, which allowed assessment of problem difficulty but not actual solutions. For each pair, children judged their certainty of solving problems of that type (e.g., same form, requiring the same operations, comparable in difficulty) by marking the efficacy value that corresponded to how they felt.

Skill and persistence. The skill test was administered after the efficacy assessment and comprised 31 problems that tapped addition and subtraction of fractions (Schunk et al., 1987). The 31 problems included six different categories (number of problems and sample problem in parentheses): addition, like denominators, no carrying (5 problems, 1/6 + 4/6); addition, like denominators, carrying (5 problems, 9/10 + 5/10); addition, unlike denominators, no carrying (6 problems, 5/16 + 2/4); addition, unlike denominators, carrying (6 problems, 11/15 + 37/45); subtraction, like denominators, no regrouping (3 problems, 7/9 - 3/9); subtraction, unlike denominators, no regrouping (6 problems, 21/36 - 8/18). About 70% of these problems were similar to those children solved during the instructional sessions; the others were more complex. Different forms of the skill test were used on the pretest and posttest to eliminate effects due to problem familiarity (pilot study parallel forms $r = .85$).

The tester presented problems to children one at a time. For each problem, children decided how long to work on it. The tester recorded the length of time children spent solving problems as a measure of persistence but gave children no feedback on solution accuracy.

Instructional Program

Children were assigned randomly within gender, ethnic background, and classroom, to one of four experimental conditions: learning goal with self-evaluation (LG-SE), learning goal without self-evaluation (LG-NoSE), performance goal with self-evaluation (PG-SE), performance goal without self-evaluation (PG-NoSE). Students received 45-minute instructional sessions over 7 days. Children assigned to the same condition met in small groups with one of two female teachers from outside the school. Teachers for the project were graduate students who formerly were classroom teachers or had some previous teaching experience with children. For any given child, the same teacher administered all seven sessions but did not administer his or her pretest. Each teacher worked with all four experimental conditions.

There were seven packets of instructional materials, one for each session. Six of these packets covered the six major types of fraction skills described above, and the final packet contained review material. The format of the seven packets was identical. The first page explained the relevant operations and exemplified their application. Each of the following pages contained several similar problems to be solved using the depicted steps. Each set included more problems than children could complete during the session.

At the start of each session, the teacher gave the goal instructions appropriate for children's condition, after which she verbally explained and demonstrated the relevant fraction operations by referring to the explanatory page and by illustrating examples on the board. Included in this phase was instruction on applications of the fraction operations to real-world problems. After this *modeled demonstration* phase (about 10 mins.), students engaged in a hands-on activity with manipulatives and cutouts and solved a few practice problems (*guided practice*, about 10 mins.). Once the teacher was satisfied that children understood what to do, children solved problems alone during *independent practice* for the remainder of the session (25 mins.). It was felt that 25 minutes per session was sufficient to allow for demonstration of differences in self-regulatory processes brought about by the goal and self-evaluation treatments.

This instructional format reflects several of the assumptions that governed the development of the curriculum standards for kindergarten through Grade 4 (National Council of Teachers of Mathematics, 1989). For one, it is conceptually oriented and emphasizes the acquisition of mathematical understanding. For another, it actively involves children in doing mathematics through hands-on activities. Third, it emphasizes the development of children's thinking skills and is intended to build their sense of confidence in their abilities. Fourth, it emphasizes application of the concepts and principles to real-world problems. And finally, within the domain of fractions, it includes a wide variety of content.

Experimental Conditions

Goals. At the start of the first instructional session, the teacher said to students assigned to the LG-SE and LG-NoSE conditions, "While you're working it helps to keep in mind what you're trying to do." The teacher then stressed the session goal of *learning* to solve problems, rather than simply solving them, by saying, "You'll be trying to learn how to solve fraction problems where the denominators are the same and you have to add the numerators." The same instructions were given at the start of each of the remaining six sessions, except that the teacher substituted the name of the fraction skill they would be covering during that session.

Children assigned to the PG-SE and PG-NoSE conditions were told at the start of the first instructional session, "While you're working it helps to keep in mind what you're trying to do." The teacher then provided a session goal that did not explicitly mention learning ("You'll be trying to solve fraction problems where the denominators are the same and you have to add the numerators"). For the remaining sessions, the teacher reiterated these instructions and substituted the name of the fraction skill to be covered during that session.

The difference between the learning and performance goal conditions seems subtle because it involves a change of a few words of the instructions. To ensure that the conditions were distinguished and that children understood their instructions, the teacher verbalized the instructions at the start of each session so the repetition could enhance their effect. In addition, the teacher asked children to repeat the instructions, and after this the teacher asked if that sounded reasonable. No child in any condition expressed displeasure at the goal instructions.

Self-evaluation. Children assigned to the LG-SE and PG-SE conditions judged their fraction capabilities at the end of each of the first six sessions. The materials and procedure were identical to those of the pretest self-efficacy assessment, except that children judged how certain they were they could solve the types of fraction problems covered during that session. Children did not make judgments at the end of the seventh (review) session.

Children assigned to the LG-NoSE and PG-NoSE conditions did not engage in end-of-session evaluation but rather completed an attitude question ("How much do you like to work fraction problems?") at the end of the first six sessions to control for potential effects of making judgments. Attitude judgments of these two conditions did not differ significantly ($F < 1$). Because students in these two conditions made self-efficacy judgments on the pretest, it is possible that the procedure sensitized them to making self-evaluations and they did so spontaneously during instructional sessions. Although this possibility cannot be ruled out, it seems unlikely because there is no evidence that the process of making efficacy judgments alters the nature of the judgments or leads persons to engage subsequently in frequent self-evaluation (Bandura, in press). Nonetheless, it would be worthwhile to replicate the study with a condition that does not judge pretest self-efficacy.

Posttest

The posttest was given on the day after the last instructional session. It included goal orientation, self-efficacy, skill, and persistence measures that were identical to those on the pretest, except that the parallel form of the skill test was used to control for potential effects of children's selective memory of pretest problems. The tester was unaware of children's experimental assignments and performances during instruction.

Study 1—Results

Means and standard deviations are presented by condition in Table 1. Preliminary analyses of variance (ANOVAs) yielded no significant between-conditions differences on pretest measures. There also were no significant differences on any measure due to gender, ethnic background, or classroom.

Self-Efficacy, Skill, Persistence

Posttest self-efficacy, skill, and persistence were analyzed with a multivariate analysis of covariance (MANCOVA) according to a 2 (goal: learning/performance) x 2 (self-evaluation: yes/no) factorial design with the corresponding pretest measures as covariates. This analysis yielded an effect due to self-evaluation, Wilks's lambda = .703, $F(3, 35) = 4.92$, $p < .01$, as well as a goal x self-evaluation interaction, lambda = .701, $F(3, 35) = 4.97$, $p < .01$.

Analysis of covariance (ANCOVA) was applied to each posttest measure using the corresponding pretest measure as covariate (see Table 2 for results). For self-efficacy, there was an effect due to self-evaluation and a goal x self-evaluation interaction. Skill yielded significance for type of goal and for self-evaluation. An effect due to self-evaluation was obtained on the persistence measure. Post hoc analyses using Dunn's multiple comparison procedure showed that the LG-SE, LG-NoSE, and PG-SE conditions did not differ significantly but each scored higher than the PG-NoSE condition on self-efficacy and skill. LG-SE students persisted longer than did PG-NoSE children.

Table 1
Study 1—Means (and *SDs*)

Measure	Phase	Experimental condition LG-SE	LG-NoSE	PG-SE	PG-NoSE
Self-Efficacy	Pretest	44.8	39.3	40.8	43.1
		(8.4)	(17.4)	(15.2)	(14.8)
	Posttest	85.3	81.0	87.9	64.6
		(9.9)	(16.3)	(9.1)	(11.8)
Skill	Pretest	2.8	3.0	3.0	2.6
		(3.6)	(3.4)	(3.3)	(3.1)
	Posttest	14.1	13.2	13.8	8.5
		(3.8)	(4.3)	(3.8)	(3.7)
Persistence	Pretest	9.0	8.5	8.5	9.2
		(2.4)	(3.0)	(3.4)	(3.1)
	Posttest	13.0	10.2	11.2	9.0
		(3.6)	(4.1)	(5.3)	(3.0)
Task orientation	Pretest	86.5	86.2	86.6	82.2
		(9.1)	(11.6)	(10.5)	(16.4)
	Posttest	94.0	94.9	89.6	74.4
		(6.8)	(7.7)	(10.2)	(19.3)
Ego orientation	Pretest	94.5	91.3	91.4	92.1
		(11.9)	(10.7)	(10.2)	(10.4)
	Posttest	80.7	82.9	79.1	97.3
		(4.9)	(8.5)	(10.4)	(6.1)
Affiliative orientation	Pretest	77.5	81.7	80.8	72.3
		(11.3)	(18.9)	(16.8)	(21.5)
	Posttest	65.4	73.0	73.7	64.5
		(17.6)	(22.0)	(19.3)	(31.9)
Work avoidant orientation	Pretest	30.7	31.8	40.7	38.5
		(15.2)	(18.4)	(30.1)	(17.3)
	Posttest	30.7	40.5	40.0	40.7
		(19.1)	(21.4)	(23.9)	(19.5)
Lesson performance	Lessons	39.1	36.6	34.6	27.0
		(8.3)	(4.1)	(7.0)	(3.1)
Self-Evaluation	Lessons	93.3	—	88.3	—
		(4.4)	—	(11.3)	—

Note. $N = 44$; $n = 11$ per condition. LG = learning goal; PG = performance goal; SE = self-evaluation; NoSE = no self-evaluation. Self-efficacy scores represent the average judgment per problem; range of scale is 10 (low) to 100. Skill means represent the number of correct solutions on 31 problems. Persistence scores are total number of mins. spent solving 31 problems. Goal orientation means represent average scores; range is 10 (low) to 100. Lesson performance is the average number of problems completed per instructional session. Self-evaluation means represent averages; range is 10 (low) to 100.

Goal Orientation

MANCOVA applied to the four posttest goal orientation scales using the corresponding pretest measures as covariates yielded significant effects for type of goal, lambda = .633, $F(4, 33) = 4.78, p < .01$ and for self-evaluation, lambda = .512, $F(4, 33) = 7.87, p < .001$. The goal x self-evaluation interaction was significant, lambda = .638, $F(4, 33) = 4.68, p < .01$.

ANCOVA applied to each measure using the corresponding pretest measure as covariate (Table 2) yielded significance on task orientation due to type of goal; the goal x self-evaluation interaction also was significant. For the ego orientation measure, there were significant effects for type of goal, for self-evaluation, and for the goal x self-evaluation interaction. Dunn's procedure showed that the LG-SE, LG-NoSE, and PG-SE conditions did not differ but each judged task orientation higher and ego orientation lower than did the PG-NoSE condition. Results for the affiliative and work avoidant measures were not significant.

Instructional Session Measures

The number of problems children completed during the independent practice portions of the instructional sessions was analyzed with a 2 x 2 ANOVA to determine the effects of treatments on children's motivation. Significant motivational effects (Table 2) were obtained for type of goal and for self-evaluation. Dunn's procedure revealed that LG-SE, LG-NoSE, and PG-SE children solved significantly more problems than did PG-NoSE students. More rapid problem solving was not attained at the expense of

Table 2

Study 1—Significant ANOVA, ANCOVA, Post Hoc Test Results

Measure	Effect	F	Post hoc
Self-Efficacy	Self-Evaluation	$F(1,39) = 13.85^{**}$	LG-SE = LG-NoSE =
	Goal × self-evaluation	$F(1,39) = 7.10^{*}$	PG-SE > PG-NoSE
Skill	Goal	$F(1,39) = 4.37^{*}$	LG-SE = LG-NoSE =
	Self-Evaluation	$F(1,39) = 6.89^{*}$	PG-SE > PG-NoSE
Persistence	Self-Evaluation	$F(1,39) = 4.31^{*}$	LG-SE > PG-NoSE
Task orientation	Goal	$F(1,39) = 13.08^{**}$	LG-SE = LG-NoSE =
	Goal × self-evaluation	$F(1,39) = 4.99^{*}$	PG-SE > PG-NoSE
Ego orientation	Goal	$F(1,39) = 7.85^{**}$	PG-NoSE > LG-SE =
	Self-Evaluation	$F(1,39) = 19.70^{**}$	LG-NoSE = PG-SE
	Goal × self-evaluation	$F(1,39) = 10.90^{**}$	
Affiliative orientation		(Nonsignificant)	
Work avoidant orientation		(Nonsignificant)	
Lesson performance	Goal	$F(1,40) = 14.99^{**}$	LG-SE = LG-NoSE =
	Self-Evaluation	$F(1,40) = 7.65^{**}$	PG-SE > PG-NoSE
Self-Evaluation		(Nonsignificant)	

Note. See Table 1 for description of measures and conditions.
$^{**}p < .01$.
$^{*}p < .05$.

accuracy; experimental conditions did not differ in the proportion of problems solved correctly (total number solved correctly divided by total number attempted).

Self-evaluation scores of the LG-SE and PG-SE conditions were compared for each of the six sessions. These analyses were nonsignificant.

Correlation Analyses

Product-moment correlations were computed among lesson performance (number of problems completed) and posttest measures (goal orientations, self-efficacy, skill, persistence) to explore relations among theoretically relevant variables (as discussed in the introductory section of this article). Given the large number of correlations, only those attaining significance at the $p < .01$ level are reported.

The number of problems that children completed related positively to self-efficacy ($r = .53$), skill ($r = .51$), and persistence ($r = .42$) and negatively to ego orientation ($r = -.50$). Self-efficacy, skill, and persistence were positively related (range of rs = .63 to .89). Task orientation related positively to self-efficacy ($r = .48$) and skill ($r = .42$); ego orientation correlated negatively (rs = -.53 and -.45, respectively) with these measures.

Correlations also were computed for subjects assigned to the self-evaluation conditions (LG-SE, PG-SE). Self-evaluation scores related positively to the number of problems completed during the lessons ($r = .55$). Among LG-SE children, self-evaluation scores correlated positively with posttest self-efficacy ($r = .74$) and persistence ($r = .77$).

Study 2—Method

Study 1 demonstrated benefits of providing children with a learning goal with or without opportunities to assess their capabilities or a performance goal with self-evaluation. The hypothesized advantage of learning goals over performance goals was obtained only when the self-evaluative procedure was not in effect.

Study 2 was designed to better explore the conditions under which learning goals might be more effective than performance goals in raising achievement outcomes. The self-evaluation treatment in Study 1 was powerful in that it required children to assess their fraction capabilities on six occasions. Given that the instructional program was designed to teach skills and that children's skills were improving, this type of repetitive self-evaluation treatment may have made it highly probable that children would perceive their skill improvement and likely outweighed any differential effects due to type of goal. Although Study 1 showed that learning goals are more effective than performance goals in the absence of explicit self-evaluation, perhaps learning goals also would prove advantageous when self-evaluation is less frequent or more subtle in nature. This type of situation reflects much school learning because learners typically do not assess their performance capabilities.

Accordingly, the procedure in Study 2 was modified. Subjects were assigned to a learning goal or performance goal condition, but all received the opportunity for self-evaluation. The actual self-evaluation procedure was altered in that judgments were collected once (near the end of the instructional program) rather than 6 times (after each session). The procedure also was more subtle in that children assessed their progress in acquiring skills rather than their capabilities for solving types of problems as they had in Study 1. Theory and research show that progress indicators of cognitive skill acquisition often are unclear and many children find it difficult to determine whether they are making progress (Schunk & Swartz, 1993a, 1993b).

It was predicted that learning goals would lead to higher self-evaluation scores and achievement outcomes than performance goals. It was felt that the progress self-evaluation would complement the learning goal emphasis on acquiring skills. Perceived progress in skill acquisition should relate positively to motivation, self-efficacy, and skillful performance (Schunk, 1991).

In addition to this measure of perceived progress, Study 2 also included a measure of self-satisfaction that required children to judge how pleased they were with their progress in skill acquisition for solving problems. This measure was collected because self-satisfaction is included in the self-reaction phase of self-regulation and is an integral component of the self-evaluation process (Bandura, 1986; Schunk, 1991). This measure could provide further information about the effects of learning goals on the self-evaluation process.

Two other measures included in Study 2 were self-efficacy for learning and goal perceptions. Self-efficacy for learning was collected at the start of the first instructional session and was given to determine whether the goal instructions differentially affected perceived capabilities for learning prior to receiving instruction and practice. Goal perceptions were assessed at the end of the last instructional session. This measure was included to determine whether students' goals during the sessions corresponded to their respective goal instructions.

Subjects

Subjects (N = 40, 20 boys, 20 girls) were fourth graders drawn from two classes in one school. Ages ranged from 9 years, 1 month to 11 years, 1 month (M = 9 years 9 months). Ethnic composition was 21 White and 19 African American; children predominantly were middle class. From an initial sample of 44 students (the entire student population of the two classes), two students were dropped because they missed instructional sessions, and two others were randomly selected from the appropriate cells to equalize cell sizes. Students were average achievers in mathematics and received instruction in regular classes.

Tests, Materials, and Procedure

Except as indicated, the same pretest, instructional session, and posttest materials and procedure were employed as those in Study 1. Following the pretest on goal orientations, self-efficacy, skill, and persistence, children were randomly assigned within gender, ethnic background, and classroom to either a learning goal (LG) or performance goal (PG) condition. Children assigned to the same condition met in small groups with one of two female teachers drawn from outside the school. These teachers (students with prior teaching experience) did not administer tests, and each teacher worked with children in each of the two conditions.

At the start of the first instructional session, children received learning or performance goal instructions (identical to those of Study 1) depending on their experimental assignment, after which the teacher left the room and children were administered the *self-efficacy for learning* assessment by a tester. This test was identical to that of the pretest except that it comprised 6 sample pairs of problems instead of 31; the 6 pairs included problems representative of each of the six lessons. For this test, children judged capabilities for learning how to solve types of problems rather than how certain they were that they already could solve them. Reliability was assessed during a pilot study with 12 comparable students who did not participate in this study. The test-retest reliability coefficient was $r = .77$.

Self-evaluation and self-satisfaction were assessed at the end of the sixth instructional session. The *self-evaluation* instrument included the same 6 sample pairs of fraction problems used in the self-efficacy for learning test. For each sample pair, children were asked to think back to when the project began and decide how well they were doing now compared with then. Children made their six progress judgments on 10-unit scales ranging from *not better* (10) to *a whole lot better* (100). Reliability was assessed during the pilot study; the test-retest r was .72.

The *self-satisfaction* measure assessed children's pleasure with their progress in skill acquisition. For each of the 6 sample pairs of problems, children judged how pleased or happy they were about how much better they were now at solving the types of problems shown compared with when the project began. The 10-unit scales ranged from *not pleased* (10) to *really pleased* (100). The test-retest reliability coefficient determined during the pilot study was $r = .69$. This is somewhat low; results should be viewed with caution.

Students' *goal perceptions* were assessed at the end of the seventh (last) instructional session. There were four scales on a sheet of paper; each ranged from *not much* (10) to *a whole lot* (100), and they were labeled *finish the work, make no errors, learn to solve the problems,* and *become better in math* (these will be referred to as *finish, errors, learn,* and *better*). Label order was counterbalanced across students. Children were asked to mark the number on each scale that corresponded to how much they were trying to do each of the things or how important it was to do each of them. They were told they could mark any number on each line and that their marks did not have to add to 100. These single-item scales were included to determine whether children's expressed goals matched the instructions with which they were provided. Future research might want to employ a more refined and elaborate measure.

Study 2—Results

Means and standard deviations are shown in Table 3. ANOVAs yielded no significant between-conditions differences on pretest measures, nor were there significant differences on any measure due to gender, ethnic background, or classroom.

Self-Efficacy, Skill, Persistence

These three posttest measures were analyzed with MANCOVA with goal (learning/performance) as the experimental factor and the corresponding pretest measures as covariates. This analysis was significant, lambda = .274, $F(3, 33) = 29.08$, $p < .001$. ANCOVA was applied to each posttest measure using the corresponding pretest measure as covariate (see Table 4). Significant effects were obtained for self-efficacy and for skill. The LG group scored higher than the PG condition on both measures.

Goal Orientation

MANCOVA applied to the four goal orientation scales using pretest measures as covariates yielded a significant effect, lambda = .208, $F(4, 31) = 29.43$, $p < .001$. ANCOVAs yielded significance on task orientation, ego orientation, and work avoidant orientation (Table 4). The LG condition scored higher on task orientation, whereas the PG condition judged ego orientation and work avoidant orientation higher.

Instructional Session Measures

ANOVA of the number of problems children completed during the independent practice portions of the instructional sessions yielded significance. LG children solved significantly more problems than did PG students. Conditions did not differ in the proportion of problems solved correctly.

Self-efficacy for learning was analyzed with ANCOVA using pretest self-efficacy as the covariate. This analysis was nonsignificant.

Self-evaluation and self-satisfaction scores were analyzed with ANOVA. Both measures yielded significance. The LG condition scored significantly higher than the PG condition on both measures.

Each of the four goal perceptions was analyzed with ANOVA. Significant results were obtained for finish (in favor of PG students); learn (in favor of LG students); and better (in favor of LG students).

Correlation Analyses

To explore relations among theoretically relevant variables product-moment correlations were computed among instructional session measures (number of problems completed, self-efficacy for learning, self-evaluation, self-satis-

Table 3
Study 2—Means (and *SD*s)

Measure	Phase	Experimental condition: Learning goal	Experimental condition: Performance goal
Self-Efficacy	Pretest	45.8 (13.7)	46.3 (15.2)
	Posttest	86.3 (5.5)	65.2 (14.8)
Skill	Pretest	2.8 (1.5)	2.5 (2.2)
	Posttest	14.4 (1.9)	8.9 (2.0)
Persistence	Pretest	13.0 (3.2)	12.7 (3.2)
	Posttest	7.9 (2.7)	8.6 (4.4)
Task orientation	Pretest	81.8 (11.5)	79.8 (10.8)
	Posttest	93.2 (6.5)	70.5 (12.2)
Ego orientation	Pretest	96.1 (7.2)	95.1 (9.4)
	Posttest	72.3 (10.0)	94.1 (10.7)
Affiliative orientation	Pretest	77.3 (18.3)	72.9 (22.3)
	Posttest	76.0 (21.0)	65.2 (28.1)
Work avoidant orientation	Pretest	40.6 (24.4)	42.2 (20.5)
	Posttest	32.5 (27.9)	51.6 (29.4)
Lesson performance	Lessons	35.0 (4.4)	29.6 (4.4)
Self-Efficacy for learning	Lessons	79.0 (20.0)	77.8 (20.6)
Self-Evaluation	Lessons	81.0 (12.0)	59.5 (15.6)
Self-Satisfaction	Lessons	80.2 (7.7)	62.4 (12.8)
Goal perceptions	Lessons		
Finish work		60.5 (16.4)	90.0 (14.9)
Make no errors		81.0 (22.2)	82.5 (20.5)
Learn strategy		87.0 (16.6)	61.0 (18.0)
Become better		91.0 (19.2)	73.5 (25.8)

Note. $N = 40$; $n = 20$ per condition. See Table 1 for description of self-efficacy, skill, persistence, goal orientation, lesson performance, and self-evaluation. Self-satisfaction and self-efficacy for learning means represent average scores; range is 10 (low) to 100. Each of the four goal perceptions consisted of one item; range is 10 (low) to 100.

faction, goal perceptions) and posttest measures (goal orientations, self-efficacy, skill, persistence). Correlations involving the same measures were comparable to those obtained in Study 1. To simplify this discussion, only $p < .01$ correlations involving variables not assessed in Study 1 are summarized.

Self-efficacy for learning related positively to number of problems completed ($r = .51$), as did self-evaluation, self-satisfaction, and learn (range of *rs* = .41 to .48). Self-evaluation and self-satisfaction scores related positively to posttest self-efficacy, skill, and task orientation (range of *rs* = .51 to .71); self-evaluation was negatively related to ego orientation and finish (range of *rs* = -.48 to -.44). Self-satisfaction was positively correlated with learn ($r = .41$) and with self-evaluation ($r = .84$). Learn correlated with posttest skill, task orientation, and affiliation orientation (range of *rs* = .44 to .60); better related to posttest skill, task orientation, errors, and learn (range of *rs* = .41 to .52).

General Discussion

These studies represent a systematic investigation into the effects of learning goals and opportunities for self-evaluation during mathematical skill acquisition. Although there is much goal setting research in educational settings, evidence is mixed on whether learning goals promote achievement outcomes better than performance goals. Self-evaluation is viewed as an

Table 4
Study 2—Significant ANOVA, ANCOVA, Post Hoc Test Results

Measure	Effect	F	Post hoc
Self-Efficacy	Goal	$F(1,37) = 34.92^{**}$	LG > PG
Skill	Goal	$F(1,37) = 77.84^{**}$	LG > PG
Persistence		(Nonsignificant)	
Task orientation	Goal	$F(1,37) = 52.38^{**}$	LG > PG
Ego orientation	Goal	$F(1,37) = 55.10^{**}$	PG > LG
Affiliative orientation		(Nonsignificant)	
Work avoidant orientation	Goal	$F(1,37) = 4.68^{*}$	PG > LG
Lesson performance	Goal	$F(1,38) = 15.09^{**}$	LG > PG
Self-Efficacy for learning		(Nonsignificant)	
Self-Evaluation	Goal	$F(1,38) = 23.78^{**}$	LG > PG
Self-Satisfaction	Goal	$F(1,38) = 28.62^{**}$	LG > PG
Goal perceptions - Finish	Goal	$F(1,38) = 35.58^{**}$	PG > LG
- Errors		(Nonsignificant)	
- Learn	Goal	$F(1,38) = 22.53^{**}$	LG > PG
- Better	Goal	$F(1,38) = 5.93^{*}$	LG > PG

Note. See Tables 1 and 3 for description of measures and conditions.
$^{**}p < .01$.
$^{*}p < .05$.

integral component of self-regulation by many theoretical approaches, but evidence is lacking on whether having students evaluate their capabilities and progress in skill acquisition enhances achievement outcomes. Based on theory and research, it was predicted that learning goals would raise achievement outcomes more than performance goals and that combining learning goals with opportunities for self-evaluation would prove the most effective.

The results of these two studies show that providing students with a goal of learning to solve problems enhances their self-efficacy, skill, motivation, and task goal orientation and that these achievement outcomes also are promoted by allowing students to evaluate their performance capabilities or progress in skill acquisition. These findings apparently are not due to goal properties, because the learning and performance goals were comparable in proximity, specificity, and difficulty. These results also cannot be due to instructional differences between treatment conditions because students in all conditions received the same amount and type of instruction and problem solving.

A theoretical explanation for these findings is as follows. Emphasizing to students that their goal is to learn to solve problems can raise their self-efficacy for learning and motivate them to regulate their task performance and work diligently. Self-efficacy is substantiated as they observe their progress in skill acquisition. Higher self-efficacy helps to sustain motivation and skillful performance (Schunk, 1991). Although the learning and performance goal instructions differed only slightly, these instructions were given by the teacher and repeated by the children at the start of every session, and this repetition apparently was sufficient to affect students' goal perceptions and achievement outcomes. Future research might attempt to replicate these findings and possibly even alter the frequency and type of goal instructions to determine the conditions under which such instructions are effective.

With respect to self-evaluation, having students assess their capabilities or progress in learning makes it clear that they have become more competent, and this perception strengthens self-efficacy and keeps students working productively. Students must be able to make accurate self-evaluations; low self-evaluations, even when students are making excellent progress, can retard motivation and learning. It may be necessary to first teach students self-evaluative skills prior to asking them to engage in self-evaluation.

The results of these studies differ in that Study 2, but not Study 1, supports the hypothesis that combining a learning goal with self-evaluation raises achievement outcomes more than does combining a performance goal with self-evaluation. The reason for this discrepancy cannot be identified precisely because the studies differed in frequency of self-evaluation (daily in Study 1, once in Study 2) and focus of self-evaluation (capabilities in Study 1, progress in skill acquisition and self-satisfaction with progress in Study 2). A daily assessment of capabilities is intensive and should clearly communicate to children that they are becoming more skillful. When self-evaluation is so salient, the type of goal may make little difference. In contrast, the single assessment session in Study 2 may not have made it clear that subjects had become more competent. Given that this assessment was closely tied to the learning goal because it called for self-evaluation of progress and self-satisfaction with that progress in skill learning, it complemented that goal better than the performance goal and was more likely to raise motivation and achievement outcomes. This explanation is supported by the finding in Study 2 that goals did not differentially affect self-efficacy for learning, so subsequent differences in achievement outcomes may have come about due to intervening self-evaluation.

These findings support theory and research on the benefits of goals and self-evaluation on self-regulation processes and achievement (Bandura, 1988, 1991a, 1991b, 1993; Schunk, 1989, 1990; Zimmerman, 1990, 1994; Zimmerman & Martinez-Pons, 1992). These results also are consistent with those of Elliott and Dweck (1988), who found that learning goals promoted a mastery motivational orientation regardless of type of ability feedback but that performance goals were effective only when students received high-ability feedback.

It is interesting that learning goals and self-evaluation raised task orientation and lowered ego orientation. These results support the Meece et al. (1988) findings that students with task-mastery goals report active cognitive engagement characterized by self-regulatory activities and that motivation to learn is positively associated with goals stressing learning and understanding. Learning goals and self-evaluations help focus children's attention on their progress and capabilities for learning (Schunk, 1990; Schunk & Swartz, 1993a, 1993b). Self-comparisons of present with past performances to determine progress constitute an integral component of a task orientation (Ames, 1992; Wentzel, 1992). Conversely, children oriented toward performance outcomes who do not evaluate their skills may be less apt to focus on learning progress and less task oriented. Performance goals can increase social comparisons and lead to an ego orientation as students determine their progress relative to that of peers (Jagacinski, 1992).

The present results must be qualified because students were acquiring skills and their self-evaluations were positive. Self-evaluation may not always have desirable effects. Asking students to periodically assess their capabilities on a task they repeatedly have failed to master might lower, rather than raise, self-efficacy and motivation, because after many negative attempts students might conclude they are incapable of learning. Students with learning problems often fall into a cycle in which failure leads to negative self-perceptions, diminished motivation, and more failure (Licht & Kistner, 1986). To be effective, self-evaluation must be linked with instruction so students learn and perceive they are making progress.

Future research might address several issues involving goal orientations. It would be informative to examine orientations of students at the start of a learning activity and then determine how goals and self-evaluations alter orientations, self-regulatory activities, and achievement outcomes. Nicholls (1983) contends that goal orientation can vary across classes and domains and is affected by social and instructional conditions. This type of study could explore students' problem solving during instruction to determine the types of self-regulatory activities they engage in and could periodically reassess goal orientations, self-efficacy, and skills to investigate how achievement outcomes change as a function of variations in self-regulatory processes.

Research also might examine how students' self-set goals compare with their goal orientation. Rather than teachers establishing goals, researchers might assess students' goal orientations to determine whether students set goals consistent with their orientations—for example, whether students who are highly task oriented set learning goals. The prediction is that they would (Ames, 1992; Dweck & Leggett, 1988), but this notion should be tested in the context of skill learning. A related point is how well students' goal orientations are served by those of teachers. For example, research might examine whether task-oriented students do better with teachers who hold a similar orientation and who provide progress feedback about learning than by teachers who emphasize performance goals involving completion of work.

It also should be noted that although the present research stressed learning or performance goals it often is not an either/or situation. Students may hold both types of goals (Nicholls, 1983); for example, they desire to learn but also want to finish their work so they avoid low grades. The present studies could be replicated with an additional condition in which students received instructions relating to both types of goals (e.g., learn the skill but also accomplish a lot of work).

The present results support the idea that self-efficacy is not merely a reflection of prior performances (Bandura, 1986). Although PG-NoSE students (Study 1) and PG children (Study 2) attempted to solve fewer problems during instructional sessions compared with students in the other conditions, the proportion of problems solved correctly by students in conditions did not differ. The present results suggest that treatment conditions differed in the extent they conveyed a sense of learning progress to students, which enhanced their self-efficacy, self-regulatory activities, and learning. This research also shows that capability self-perceptions help to predict skillful performance. Although the present studies did not test the mediational role of self-efficacy, other research shows that self-efficacy mediates the relation between prior experience and mathematical problem solving (Pajares & Miller, 1994). Personal expectations for success are viewed as important influences on achievement by different theoretical approaches (Bandura, 1986, 1989; Covington, 1992; Weiner, 1985).

The results of this project have implications for teaching mathematics. As discussed earlier, the instructional procedure reflects several assumptions that governed the formation of mathematics curriculum standards for young children (National Council of Teachers of Mathematics, 1989). Learning goals can be easily incorporated by teachers into classroom instruction. Among children who are cognitively capable of evaluating their capabilities, self-evaluation may be a useful adjunct to testing as a means of assessing students' skills and of providing information to use in designing instruction. Although learning goals and self-evaluation are not necessary for all classroom activities, the present results suggest that, when combined with a sound instructional program, they facilitate self-regulated learning and achievement outcomes.

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