Self-Efficacy and Cognitive Achievement: Implications for Students with Learning Problems

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Abstract:
This article presents a self-efficacy model of achievement that comprises entry characteristics, self-efficacy for learning, task engagement variables, and efficacy cues. Students' sense of self-efficacy for learning is influenced as they work on tasks by cues that signal how well they are learning. Research is summarized on the effects of social and instructional variables on self-efficacy and achievement behaviors. Empirical evidence supports the idea that self-efficacy predicts student motivation and learning. Future research directions are provided, along with educational implications for students with learning problems.

Article:
Recent research in various domains has demonstrated that learning is a complex process involving instructional, social, and learner variables (Pintrich, Cross, Kozma, & McKeachie, 1986). The research program that I have been conducting has focused on two related issues. One issue is how social and instructional factors associated with learning contexts affect students' self-perceptions, learning, and motivation. The primary self-perception measure that I have studied is *perceived self-efficacy*, or personal beliefs about one's capabilities to organize and implement actions necessary to attain designated levels of performance (Bandura, 1982). The second issue is how self-efficacy functions as a predictor of achievement behaviors. The subjects in most of these studies have been students who have encountered problems learning academic content. At the outset of these studies, subjects typically display low performance in content area skills and self-efficacy.

The conceptual focus derives from Bandura's (1986) social cognitive learning theory, which views human functioning in terms of reciprocal interactions among behaviors, environmental variables, and cognitions and other personal factors. This reciprocity is well exemplified with perceptions of self-efficacy. Self-efficacy can have diverse effects on achievement behaviors (discussed below). In turn, students' actual performances—their successes and failures at achievement tasks — convey information to them about how well they are learning, which can influence self-efficacy. Self-efficacy is affected by environmental factors, such as when students observe models or receive performance feedback from teachers. Individuals in students' social environments may react to students based on attributes typically associated with them rather than based on what students actually do. Teachers often judge students with learning disabilities (LD) as less capable than nondisabled students and hold lower academic expectations for them, even in content areas where students with LD are performing adequately (Bryan & Bryan, 1983).

One effect of self-efficacy on achievement behaviors involves choice of activities. Students who hold a low sense of efficacy for accomplishing a task may attempt to avoid it, whereas those who believe they are capable should participate more eagerly. Self-efficacy also can affect effort expenditure and persistence. Especially when they encounter difficulties, students who believe that they can perform well ought to work harder and persist longer than those who doubt their capabilities (Bandura, 1982).

Individuals acquire information to assess self-efficacy from their actual performances, vicarious experiences, forms of persuasion, and physiological indexes. In general, one's successes raise efficacy and failures lower it, although once a strong sense of efficacy is developed an occasional failure may not have much impact. In school, students who observe similar peers perform a task may believe that they, too, are capable of performing it. Information acquired vicariously ought to have a weaker influence on efficacy than performance-based information, because vicarious information can be negated by subsequent failure. Students receive persuasive information from teachers (e.g., "You can do this"). Positive feedback can enhance efficacy, but this increase is apt to be short-lived if students' subsequent efforts are poor. Students also derive efficacy information from such physiological indexes as heart rate and sweating. Anxiety symptoms can convey that one lacks the skills to perform well.

I do not wish to imply that self efficacy is an important variable in all situations. Efficacy appraisal typically does not occur for habitual routines or for tasks requiring skills that are well established (Bandura, 1982). In school, self-efficacy beliefs are likely to be more salient and influential when learning is involved than when students are performing previously learned skills. Even in the former situations, many other variables will affect skill development. Cognitive *abilities* are good predictors of what and how rapidly students learn (Como & Snow, 1986). *Outcome expectations,* or beliefs concerning the outcomes of one's actions, also are important. Students are generally not motivated to behave in ways that they believe will result in negative outcomes. Another influence is the *value* students place on outcomes, or how important they believe those outcomes will be for their lives. Students who perceive little value in learning particular content may expend little effort even if they feel efficacious about learning that content (Schunk, in press).

Self-efficacy was originally applied in therapeutic settings with fearful clients (e.g., snake phobics) to help explain their behaviors that are designed to overcome anxiety and cope with threatening activities (Bandura, 1982). Efficacy research has subsequently explored domains such as athletic performances, career choices, and health behaviors. My research has been in educational contexts where students are learning cognitive skills (e.g., mathematics, reading comprehension). Subjects in most of these studies have been elementary or middle school students who previously have experienced learning problems in school and who begin with low skills and perceived efficacy.

Subjects initially are pretested on self-efficacy, skill, and persistence. To assess self-efficacy, testers briefly show subjects samples of the academic content (i.e., math problems, reading passages and questions). For each sample, subjects judge their certainty of solving problems (answering questions) like those shown; thus, subjects judge their capabilities for solving different problems (answering different questions) and not whether they can solve particular problems (answer particular questions). On the skill test, subjects decide whether to solve (answer) each of several problems (questions) and how long to work on them, which provides a measure of persistence. Treatment procedures are subsequently implemented in conjunction with an instructional program on the content area skills. Subjects are post-tested on completion of the instructional program.

Recently I have begun to include a measure of *self-efficacy for learning,* or students' beliefs about their capabilities to effectively apply their knowledge and skills to learn academic content. As mentioned earlier, self-efficacy beliefs are likely to be more influential when learning is involved than when students are performing previously learned skills. To assess self-efficacy for learning, testers ask subjects to judge their capability to learn how to solve (answer) different types of problems (questions) rather than their capability for solving (answering) types of problems (questions).

In the following section, I present a self-efficacy model of school learning. Empirical evidence is summarized showing the effects on self-efficacy and achievement behaviors of task engagement (social, instructional) variables. I then discuss evidence for the predictive utility of self-efficacy during cognitive skill learning. The article concludes with suggestions for future research and educational implications of the research findings for students with learning problems.

SELF-EFFICACY AND COGNITIVE SKILL LEARNING

Figure 1 portrays the hypothesized operation of self-efficacy during cognitive skill learning. I previously have discussed aspects of this model (Schunk, 1984a, 1985b, 1987, in press). It is derived from different theoretical traditions, including social cognitive learning, attribution, and instructional psychology (Bandura, 1986; Corno & Mandinach, 1983; McCombs, 1984; Weiner, 1985; Winne, 1985).

Entry Characteristics

Students differ in *aptitudes* and *prior experiences.* Aptitudes include general abilities, skills, strategies, interests, attitudes, and personality characteristics (Cronbach & Snow, 1977). Educational experiences derive from influences such as prior schools attended, interactions with teachers, and time spent on different subjects. Aptitudes and experiences are related. For example, skilled readers typically perform well on reading tasks, which earns them teacher praise and high grades. In turn, these outcomes may lead students to develop greater interest in reading, which can lead to further skill improvements.

Self-Efficacy for Learning

At the outset of a learning endeavor, we may speak of self-efficacy for learning, acquiring knowledge, developing skills, or mastering material. Aptitudes and prior experiences will affect students' initial beliefs about their learning capabilities. Students who previously have performed well in a content area are apt to believe that they are capable of further learning; students who have experienced difficulties may doubt their capabilities. At the same time, efficacy is not a mere reflection of aptitudes and prior experiences. Using students of high, average, and low mathematical ability, Collins (1982) found students of high and low mathematical self-efficacy within each ability level. Students solved problems and could rework those they missed. Ability was positively related to skillful performance, but regardless of ability level, students with higher efficacy solved more problems correctly and chose to rework more that they missed.

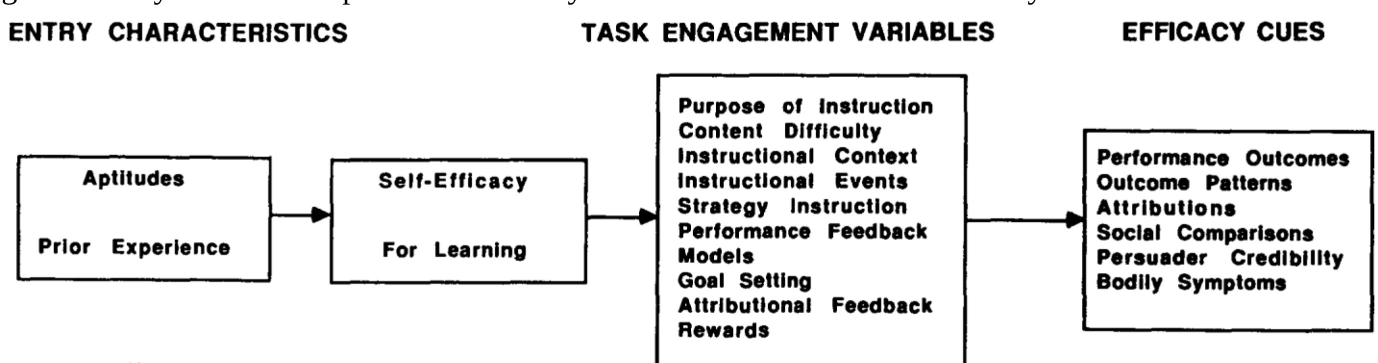

Figure 1. Self-efficacy model of cognitive skill learning.

Efficacy Cues

I discuss task engagement variables in the next section. While participating in learning activities, students derive cues that signal how well they are learning and that they use to assess efficacy for continued learning. In turn, higher efficacy for learning enhances motivation and skill acquisition.

Performance outcomes are influential cues. Successes generally raise self-efficacy and failures lower it; however, an occasional failure after many successes may not have much impact, nor should one success after many failures (Schunk, in press). Early learning is often fraught with failures, but the perception of progress can promote efficacy; thus, *outcome patterns* are important. Self-efficacy may not be aided much if students believe that their progress is slow or that their skills have stabilized at low levels.

Attributions, or perceived causes of successes and failures, influence efficacy in important ways. Achievement outcomes often are attributed to such causes as ability, effort, task difficulty, and luck (Frieze, 1980; Weiner, 1985). Children view effort as the prime cause of outcomes. With development, ability attributions become increasingly important influences on expectancies, and the role of effort declines in importance (Harari &

Covington, 1981; Nicholls, 1978). Success achieved with great effort should raise efficacy less than success achieved with minimal effort, because the former implies that skills are not well developed (Bandura, 1982).

Students also derive cues from *social comparisons.* Festinger (1954) hypothesized that, where objective standards of behavior are unclear or unavailable, observers evaluate themselves through comparisons with others, and that the most accurate self-evaluations derive from comparisons with those who are similar in the ability or characteristic being evaluated. Students frequently compare their performances with those of their peers. Students may feel more (less) efficacious when they believe that they are accomplishing more (less) work than most of their peers. Peers also are important models, and observing models is a form of social comparison. Observing similar peers improving their skills can instill a sense of efficacy for learning, whereas observed failures cast doubt on students' capabilities to succeed (Schunk, 1985b). Similarity can be based on perceived competence or on such personal attributes as age, sex, and ethnic background (Rosenthal & Bandura, 1978).

Persuader credibility is important because students may experience higher efficacy when they are told they are capable of learning by a trustworthy source (e.g., the teacher), whereas they may discount the advice of less credible sources. Students also may discount otherwise credible sources if they believe that the sources do not fully understand the nature of the task demands (e.g., difficult for students to comprehend) or the effect of contextual factors (e.g., too many distractions).

Bodily symptoms serve as physiological cues for appraising efficacy. Sweating and trembling may signal that students are not capable of learning. Students who notice that they are reacting in a less agitated fashion to academic tasks may feel more efficacious about learning.

Task Engagement Variables

Task engagement refers to students' cognitive activities (attending, rehearsing, processing, and integrating information), along with their verbalizations and behaviors, that are focused on the academic task at hand (Brophy, 1983; Corno & Mandinach, 1983). Shown in Figure 1 are some variables that can impact students while they are engaged in tasks. This list is not exhaustive, but rather is suggestive of influences that seem germane to school learning settings.

The *purpose of instruction* refers to the uses students believe they will make of the material to be learned (Marx, 1983). Students' beliefs about the outcomes of learning can affect self-efficacy. For example, when teachers announce that material will be on a test, students who have performed poorly on tests may experience anxiety, which could lead to low efficacy. Students who previously have earned good grades on term papers may react with high efficacy to the announcement that they will have to write a term paper.

Perceived *content difficulty* is an important task engagement variable. Content that students believe is difficult may lead to a lower sense of self-efficacy for learning than material that students believe is easier to learn. Included here are students' beliefs about the type of cognitive processing required by the content. Students who have trouble processing information required by a task may conclude that they have low ability, and they will feel less efficacious about learning. Salomon (1984) has shown that students perceive learning from TV to be easier than learning from print, hold higher efficacy for learning from TV, and invest less mental effort in learning. For written materials, self-efficacy relates positively to mental effort.

The *instructional context* includes such factors as the setting (physical conditions, distractions), the instructional format (whole class, small group, individualized), materials, and equipment (videotapes, computers). Students' beliefs about how well they learn under these various conditions will affect their efficacy for learning. For example, some students believe that they learn well in an individualized format, whereas others may believe that they derive greater benefits in small groups.

Instructional events include the teacher's explanations, demonstrations, and reteaching, along with students' activities. Teachers who present material in a fashion that students can comprehend are more apt to engender high efficacy than teachers who give disorganized presentations. Use of instructional time also is important. Teachers who provide students with multiple opportunities for task engagement (instruction, practice, review) enhance opportunities to experience success.

Teacher assistance is important. Teachers who provide much assistance to students may improve their skills but do little to raise their self-efficacy for learning, because students may believe that they could not succeed on their own. Also included in this category are teachers' expectations for students' learning, which they often convey to students. Teachers may cue positive (negative) expectations by asserting that students will enjoy (not enjoy) the task and do well (poorly) on it (Brophy, 1983). These statements, coming from a credible judge of student abilities, should impact students' efficacy.

Much research shows that students benefit from training on strategies, or cognitive plans oriented toward improving performance (Baker & Brown, 1984; Paris, Cross, & Lipson, 1984). *Strategy instruction* also can influence self-efficacy. The belief that one understands and can effectively apply a strategy that will enhance achievement can lead to a greater sense of control over learning outcomes, which should promote self-efficacy (Licht & Kistner, 1986; Schunk, in press). At the same time, poor readers often lack conditional knowledge concerning when and why to apply strategies (Myers & Paris, 1978). Providing remedial readers with strategy training and strategy value information, or information that strategy use can improve performance, enhances self-efficacy and skills better than strategy training without value information (Schunk & Rice, 1987).

In learning a strategy, students benefit from verbalizing aloud the component steps while applying them to a task. Overt verbalization can facilitate learning because it directs students' attention to important task features, assists strategy encoding and retention, and helps students work in a systematic fashion (Schunk, 1985b). Verbalization seems especially beneficial for students with learning problems (Borkowski & Cavanaugh, 1979). Schunk and Rice (1984) presented remedial readers in Grades 2 through 4 with instruction in listening comprehension. Half of the children in each grade verbalized strategic steps prior to applying them to questions; the other half received strategy instruction but did not verbalize the steps. Strategy instruction led to higher self-efficacy across grades and promoted performance among third and fourth graders, but not among second graders. Perhaps the demands of verbalization, along with those of the comprehension task itself, were too complex for the youngest subjects. These children may have focused their efforts on the comprehension task, which would have interfered with strategy encoding and retention.

In a follow-up study (Schunk & Rice, 1985), children in Grades 4 and 5 with reading comprehension deficiencies received instruction and practice opportunities. Within each grade, half of the subjects verbalized a strategy prior to applying it. Strategy verbalization led to higher reading comprehension, self-efficacy, and ability attributions across grades. The latter finding suggests that strategy verbalization may enhance self-efficacy through its effect on ability attributions.

Schunk and Cox (1986) compared the effects of different forms of verbalization among students with LD during mathematics instruction. Continuously verbalizing a strategy while solving problems led to higher self-efficacy and skill compared with discontinued verbalization or no verbalization. It is possible that, when instructed to no longer verbalize aloud, discontinued verbalization students had difficulty internalizing the strategy and did not use covert instructions to regulate their performances. A fading treatment, such as that included in self-instructional training (Meichenbaum, 1977), can promote strategy internalization.

Performance feedback (e.g., "You're doing much better") can signal that students are making progress in learning, which raises self-efficacy. Teacher feedback is less important when students can derive their own feedback, such as by checking answers. Students benefit from feedback in situations where progress in learning is unclear. Exposure to *models* is an important task engagement variable. In school, students observe diverse adult and peer models. Perceived similarity of observers and models is a cue used to assess self-efficacy. Models who are similar or slightly higher in competence provide the best information. Students who observe a similar peer learn a task are apt to believe that they can learn as well (Schunk, 1985b). Peer models may exert more beneficial effects on self-efficacy than teacher models, especially among students with learning problems who doubt that they are capable of attaining the teacher's level of competence.

One way to enhance perceived similarity is to use multiple models, which increase the probability that observers will perceive themselves as similar to at least one of the models (Thelen, Fry, Fehrenbach, & Frautschi, 1979). Another way is to use coping rather than mastery models. Coping models initially demonstrate the typical fears and deficiencies of observers but gradually improve their performances and gain self-confidence, whereas mastery models demonstrate faultless performance from the outset (Kazdin, 1978). Coping models illustrate how determined effort and positive thoughts can overcome difficulties.

These ideas were tested with elementary school children who had experienced learning problems in mathematics (Schunk & Hanson, 1985; Schunk, Hanson, & Cox, 1987). Children observed videotapes portraying an adult teacher and one or more peer (student) models. The teacher repeatedly provided instruction, after which the models solved problems. Some subjects observed peer mastery models, who easily grasped the operations, solved all problems correctly, and verbalized positive achievement beliefs reflecting high self-efficacy and ability, low task difficulty, and positive attitudes. Others observed coping models, who initially made errors and verbalized negative achievement beliefs but gradually began to verbalize coping statements (e.g., "I'll have to work hard on this one") and became more skillful. Eventually the coping models' problem-solving behaviors and verbalizations matched those of the mastery models. Other children observed only a teacher model or did not observe videotapes.

Observing peer models enhanced self-efficacy for learning, along with posttest self-efficacy and skillful performance, more than observing a teacher model or not observing a model. Schunk and Hanson (1985) found no differential effects of coping and mastery models on children's self-efficacy and skills. Subjects had experienced prior successes with the experimental content (subtraction of whole numbers), and may have drawn on those experiences and focused more on what the models had in common (task success) than on their differences (rate of learning, number of errors, types of verbalization). In contrast, the Schunk et al. (1987) subjects had few, if any, prior successes with the content (addition and subtraction of fractions). In this study, coping models enhanced achievement outcomes more than observing mastery models, and multiple models—coping or mastery—promoted achievement outcomes as well as a single coping model and better than a single mastery model. Children who observed single models judged themselves more similar in competence to coping models than to mastery models. The benefits of multiple models did not depend on perceived similarity in competence. Similarity in competence may be a more important source of efficacy information when children are exposed to a single model and have fewer modeled cues to use in judging self-efficacy.

Goal setting involves comparing one's present performance against a standard. When students pursue a goal, they may experience heightened self-efficacy for attaining it as they observe their goal progress. A sense of learning efficacy helps sustain task motivation. Goals exert their effects through their properties: specificity, difficulty level, proximity (Bandura & Cervone, 1983; Locke, Shaw, Saari, & Latham, 1981). Goals that incorporate specific performance standards are more likely to raise learning efficacy because progress toward an explicit goal is easier to gauge. General goals (e.g., "Do your best") do not enhance motivation. In the context of an instructional program, Schunk (1985a) found that specific performance goals—whether self-set or set by teachers — enhanced mathematics achievement and self-efficacy more than no goals in students with LD.
Goal difficulty refers to the level of task proficiency required as assessed against a standard. Although students initially may doubt their capabilities to attain goals they believe are difficult, working toward difficult goals can build a strong sense of efficacy, because difficult goals offer more information about learning capabilities than easier goals.

Goals also are distinguished by how far they project into the future. Proximal goals, which are close at hand, result in greater motivation than more distant goals. As students observe their progress toward a proximal goal, they are apt to believe that they are capable of further learning. During an instructional program, Schunk (1983b) found that providing students with proximal goals enhanced their mathematical self-efficacy more than no goals. Bandura and Schunk (1981) found that, compared with distal or no goals, proximal goals heightened children's task motivation and led to the highest mathematical self-efficacy, interest, and skillful performance. Distal goals resulted in no benefits over those obtained from receiving the instructional program.

Attributional feedback, which links students' successes and failures with one or more causes, is a persuasive source of efficacy information. Young children stress the role of effort. Although ability information becomes more important with development (Nicholls, 1978), effort feedback can motivate students of different ages. Being told that one can achieve better results through harder work (i.e., effort feedback for prior difficulties) can motivate one to do so and convey that one possesses the necessary capability to succeed (Andrews & Debus, 1978; Dweck, 1975). Providing effort feedback for prior successes supports students' perceptions of their progress in learning, sustains motivation, and increases efficacy for continued learning (Schunk, 1985b). Effort feedback may be especially useful for students with learning problems, who often place insufficient emphasis on the role of effort in achievement contexts (Torgesen & Licht, 1983).

Teacher praise can affect self-efficacy for learning, because praise conveys how the teacher views student abilities (Weiner, Graham, Taylor, & Meyer, 1983). Especially when students believe that a task is easy, praise combined with effort information (e.g., "That's good. You've been working hard.") signals low ability. Students who believe that the teacher does not expect much of them are apt to doubt their capabilities.

The timing of attributional feedback also is important. Early task successes constitute a prominent cue used to formulate ability attributions (Weiner, 1974). Feedback that links students' early successes with ability (e.g., "That's correct. You're really good at this.") should enhance learning efficacy. Many times, however, effort feedback for early successes may be more credible, because when students lack skills they realistically have to expend effort to succeed. As students develop skills, switching to ability feedback may better enhance self-efficacy.

These ideas have been tested in several studies (Schunk, 1982, 1983a, 1984b; Schunk & Cox, 1986). Schunk (1982) found that linking children's prior achievements with effort (e.g., "You've been working hard") led to higher task motivation, self-efficacy, and subtraction skill, compared with linking their future achievement with effort ("You need to work hard") or not providing effort feedback. Schunk (1983a) showed that ability feedback for prior successes ("You're good at this") enhanced self-efficacy and skill better than effort feedback of ability-plus-effort (combined) feedback. The latter subjects judged their effort expenditure during the instructional program greater than ability-only students. Children in the combined condition may have discounted some ability information in favor of effort.

To investigate sequence effects, Schunk (1984b) periodically provided one group of children with ability feedback, a second group with effort feedback, and a third group with ability feedback during the first half of training and effort feedback during the second half. This latter sequence was reversed for a fourth condition. Providing ability feedback for early successes, regardless of whether it was continued, led to higher ability attributions and posttest self-efficacy and skill, compared with providing effort feedback for early successes.

In the Schunk and Cox (1986) study, students received effort feedback during the first half of the instructional program, effort feedback during the second half, or no effort feedback. Each type of feedback promoted self-efficacy and skillful performance better than no feedback; feedback during the first half of training enhanced students' effort attributions. Given students' learning disabilities, effort feedback for early or later successes may have seemed credible, because the students realistically had to expend effort to succeed. Over time, effort feedback could actually lower efficacy, because as students become more skillful they might wonder why they still have to work hard to succeed.

Rewards can promote task performance (Lepper & Greene, 1978) and can enhance self-efficacy when they are tied to students' actual accomplishments. Telling students that they can earn rewards based on what they accomplish can instill a sense of efficacy for learning. As students work at a task and note their progress, this sense of efficacy is validated. Receipt of the reward further validates self-efficacy, because it symbolizes progress. When rewards are not tied to actual performance, they actually may convey negative efficacy information; students might infer that they are not expected to learn much because they do not possess the requisite capability. In the context of a long division instructional program, Schunk (1983c) found that performance-contingent rewards led to more rapid problem solving, as well as higher skill and self-efficacy, compared with task-contingent rewards and unexpected rewards. Offering rewards for participation (task-contingent) led to no benefits over those due to receiving instruction.

Predictive Utility of Self-Efficacy

The predictive utility of self-efficacy for learning can be determined by relating this measure to the number of problems that children complete during the independent practice portions of instructional sessions. Significant and positive correlations have been obtained (range of rs = .33 to .42). More rapid problem solving has not been attained at the expense of accuracy. Similar correlations have been obtained using the proportion of problems solved correctly. Self-efficacy for learning also relates positively to posttest self-efficacy and skill (range of *rs* = .46 to .90).

The predictive utility of pretest efficacy is often inadequate because subjects lack skills and judge efficacy low. In contrast, there is a greater variability in posttest measures of efficacy and skill. Studies in different domains have yielded significant and positive correlations between posttest efficacy and skill (range of rs = .27 to .84). Multiple regression has been used to determine the percentage of variability in skillful performance accounted for by self-efficacy. These analyses show that perceived efficacy accounts for a significant increment in the variability in posttest skill; R^2 values range from .17 to .24. Schunk (1981) employed path analysis to test how well a causal model of achievement reproduced the original correlation matrix comprising instructional treatment, self-efficacy, persistence, and skill. The most parsimonious model that reproduced the data showed that treatment exerted both a direct effect on skill and an indirect effect through persistence and efficacy, that the effect of treatment on persistence operated indirectly through efficacy, and that efficacy influenced skill and persistence.

FUTURE DIRECTIONS

Research is needed on whether task engagement variables operate differently during various phases of instruction. Students engaged in learning activities may initially perceive material as difficult. These perceptions will change as they receive additional instruction and practice. Perceived content difficulty may be a better predictor of self-efficacy during the later stages of learning.

Further exploration of motivational indexes is needed. Choice of activities is not a good motivational index because students typically do not choose whether to participate in learning activities (Brophy, 1983). Choice is meaningful only under a limited set of conditions (e.g., free time).

High efficacy will not necessarily lead to greater persistence. Students may persist at tasks because of high efficacy for learning but also because teachers keep them working on the tasks. As skills develop, self-efficacy might bear a negative, rather than a positive, relationship to persistence; students should not have to persist as long to solve problems correctly or answer questions. The studies summarized in the preceding section yielded persistence-efficacy correlations ranging from + .30 to — .29. Where skill learning is involved, cognitive effort seems to be a more appropriate motivational index (Como & Mandinach, 1983). Research might explore students' cognitive efforts during instruction and relate these to self-efficacy for learning.

Developmental research is needed to explore the cues that students derive from task variables and how students cognitively process these cues to form efficacy beliefs. For example, young children's social comparisons focus on the overt performances of their peers. As children acquire a conception of underlying abilities, the basis for perceived similarity shifts from tangible outcomes to underlying abilities. Whom children use as the basis for social comparisons is an important question. Many students with learning problems spend part of the school day in resource rooms and the remainder in regular classes, and employ both groups for social comparisons.

Academically handicapped students may perceive their abilities higher when they compare themselves with other handicapped peers than when they compare themselves with regular class students (Coleman, 1983; Strang, Smith, & Rogers, 1978).

Research could examine the judgment-making process among students with learning problems. To accurately judge efficacy requires that one distinguish successes from failures. Judging efficacy in cognitive skill learning contexts often is complex. Students may learn only some of the component sub-skills of a task. Being unaware of the full range of task demands can lead to efficacy misjudgment. In mathematics, students often employ *buggy algorithms*, or erroneous strategies that result in problem solutions (Brown & Burton, 1978). Because buggy algorithms produce solutions, employing them may lead to a false sense of competence. Similarly, students who solve problems correctly but are unsure whether their answers are correct may not feel more efficacious.

Students with learning problems often enter a cycle in which school failure and ability self-doubts influence each other (Licht & Kistner, 1986). Yet not all students with learning problems enter this cycle; some feel confident about learning in spite of repeated difficulties. We might examine the judgment-making processes of these latter students. Do they employ buggy algorithms, or are they aware of their learning problems but expect that such factors as heightened task attention and effort expenditure will produce better results in the future?

Another area to address is maintenance and transfer of efficacy beliefs. Many educational interventions are brief — 3 weeks or less. Especially with complex cognitive skills, increases in efficacy brought about by relatively short interventions may not prove durable over time or transfer to classroom (nonexperimental) settings. Strategy training research, for example, shows that students often do not maintain their use of strategies or transfer them outside of the experimental context (Borkowski & Cavanaugh, 1979). These problems arise in part because students believe that such factors as effort expended and time available are more important influences on their achievement than is their use of strategies (Fabricius & Hagen, 1984). Maintenance and transfer should be facilitated by including multiple tasks in lengthier interventions.

By working with teachers, researchers can study how self-efficacy beliefs change over the course of a semester or school year. A future research agenda might well include teachers as active research collaborators.

EDUCATIONAL IMPLICATIONS

The procedures discussed in this article can be implemented by teachers. For example, the comprehension procedures were applied to children's regular reading groups (Schunk & Rice, 1984, 1985, 1987). Teaching students to use a comprehension strategy by having them verbalize steps is easily implemented in small group reading instruction, and fits well with the suggestion by researchers to teach strategies to students, especially those with learning problems (Borkowski & Cavanaugh, 1979; Brown, Palincsar, & Armbruster, 1984; Paris et al., 1984; Raphael & McKinney, 1983).

Teachers' instructional presentations can include information designed to affect students' self-efficacy. Brophy (1983) discusses various types of task presentation statements made by elementary teachers. Two contrasting types are positive expectations for students (e.g., "I know that you'll learn this") and negative expectations ("Some of you might find this hard"). These types of statements are forms of persuasive information and, given that they are uttered by a credible source, can have important effects on students' efficacy for learning. Although students' subsequent efforts will validate or refute this efficacy information, teachers can have an important impact on students' initial learning beliefs.

Performance and attributional feedback can be applied to seatwork activities. Performance feedback that signals progress in learning validates students' beliefs that they are acquiring skills, and can enhance motivation for further learning. It is important that attributional feedback be viewed as credible by students. Effort feedback for success at a task that students believe is easy may lead them to wonder whether the teacher thinks they are low in ability (Weiner et al., 1983). Similarly, students may discount ability feedback after they have had to struggle to succeed.

Goal setting can be incorporated in various ways. Teachers have lesson goals for students. Contingency contracts specify learning or performance goals. Goal-setting conferences, in which teachers meet periodically with students to discuss their goal attainment and to set new goals, enhance achievement and capability self-evaluations (Gaa, 1973). Short-term goals are maximally motivating with young children, and may be especially beneficial for students with learning problems because they provide concrete standards against which to gauge progress.

Peer models seem especially useful for children with learning problems who may doubt their learning capabilities. Observation of an adult teacher flawlessly demonstrating cognitive skills may teach students skills but not help build efficacy for learning. Such students may view the teacher as possessing a level of competence that they are unlikely to attain. Observing similar peers successfully perform a task can raise self-efficacy in students because they are apt to believe that if the peers can learn, they can also improve their skills.

Teachers often apply these ideas by selecting one or more students to demonstrate a skill to other class members. The typical practice is to choose peers who master skills readily — mastery models. Among students with learning problems, other students who have learning problems, but who have mastered skills, may make better models. Peers also could model such coping behaviors as increased concentration and hard work. While students are engaged in seatwork, teachers can provide social comparative information (e.g., "See how well Kevin is doing? I'm sure that you can do just as well."). Teachers need to insure that learners will view the comparative performances as attainable; judicious selection of referent students is necessary. Peers also can be used to enhance observers' self-efficacy in small groups.

Successful groups in which each member is responsible for some aspect of the task and in which members share rewards based on their collective performance can reduce negative, ability-related social comparisons (Ames, 1984). Teachers need to select tasks carefully, because unsuccessful groups will not raise efficacy.

Strain and his colleagues have successfully used peers as social skill trainers with withdrawn children (Strain, Kerr, & Ragland, 1981). Peers are trained to initiate social contacts with verbal signals and motor responses. Such initiations increase withdrawn children's subsequent social initiations, and gains often generalize to classrooms. A less formal application involves pairing a socially competent peer with a less competent child to work on a task. The opportunity for social interaction within the dyad can help to promote the social skills of the less competent child (Mize, Ladd, & Price, 1985).

The use of peers as instructional agents has most commonly occurred in tutoring programs. Despite some methodological problems in studies, tutoring can lead to academic gains by tutor and tutee (Feldman, Devin-Sheehan, & Allen, 1976). Peer instructors also are helpful where their teaching strategies fit well with learners' capabilities or the skills being taught. Adult teachers typically employ more verbal instruction and relate information to be learned to other material, whereas peer teachers tend to use nonverbal demonstrations and link instruction to specific items (Ellis & Rogoff, 1982). Peer instruction seems beneficial for students with learning problems and for other learners who may not process verbal material particularly well.

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