DOCUMENT RESUME

ED 280 893 TM 870 225

AUTHOR Schunk, Dale H.
TITLE Domain-Specific Measurement of Students' Self-Regulated Learning Processes.
PUB DATE Apr 87
NOTE 30p.; Paper presented at the Annual Meeting of the American Educational Research Association (Washington, DC, April 20-24, 1987).
PUB TYPE Reports - Research/Technical (143) -- Speeches/Conference Papers (150)

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS Behavioral Objectives; *Cognitive Processes; Cognitive Style; Construct Validity; Correlation; Elementary Secondary Education; *Learning Strategies; Learning Theories; Measurement Techniques; Personality Measures; *Self Concept; *Self Evaluation (Individuals); Student Motivation; Test Reliability; *Test Validity
IDENTIFIERS *Domain Specifications; *Self Efficacy; Self Regulation

ABSTRACT

This article discusses the assessment of self-regulated learning processes as students acquire cognitive skills in specific academic domains. Domain-specific assessment is useful for understanding student learning and for planning instructional activities that help to promote it. Although much psychological research has used general measures of cognitive functioning to study human behavior, general measures do not reliably predict what people do in specific situations. Some measures of student aptitude, such as intelligence or abilities, correlate with student achievement, but complex aptitude constellations often predict learning better than any aptitude alone. The assessment of one type of domain-specific self-regulated learning process--perceived self-efficacy--is discussed to include instrument development, reliability, and validity. Empirical evidence is presented demonstrating the predictive utility of self-efficacy in various domains, along with research showing how self-efficacy is affected by instructional contexts. Future research suggestions are provided. (A six-page list of bibliographic references is attached.) (Author/JAZ)

***********************************************************************
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
***********************************************************************

ED280893

# Domain-Specific Measurement of Students' Self-Regulated Learning Processes

Dale H. Schunk

School of Education

University of North Carolina - Chapel Hill

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

☒ This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

D. H. Schunk

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

Paper presented in a symposium entitled, "Measuring student self-regulated learning: Methods, issues, and outcomes," at the annual meeting of the American Educational Research Association, Washington, April 1987.

TM 870 225



ERIC

## Abstract

This article discusses the assessment of self-regulated learning processes as students acquire cognitive skills in specific academic domains. Domain-specific assessment is useful for understanding student learning and for planning instructional activities that help to promote it. Although much psychological research has used general measures of cognitive functioning to study human behavior, general measures do not reliably predict what people do in specific situations. Some measures of student aptitude (e.g., intelligence, abilities) correlate with student achievement, but complex aptitude constellations often predict learning better than any aptitude alone. The assessment of one type of domain-specific self-regulated learning process - perceived self-efficacy - is discussed to include instrument development, reliability, and validity. Empirical evidence is presented demonstrating the predictive utility of self-efficacy in various domains, along with research showing how self-efficacy is affected by instructional contexts. Future research suggestions are provided.



ERIC

# Domain-Specific Measurement of Students' Self-Regulated Learning Processes

This article examines the assessment of self-regulated learning processes as students acquire cognitive skills in specific academic domains. As used throughout this article, self-regulated learning processes refer to cognitions that activate and sustain planful behaviors oriented toward learning (Corno & Mandinach, 1983; Zimmerman, 1986). These processes include such strategies and activities as attending to instruction, coding information and integrating it with information in memory, rehearsing material to be learned, and utilizing information to solve problems, as well as attitudes and personal beliefs concerning capabilities for learning and the anticipated outcomes of learning (Schunk, 1986; Winne, 1985).

I believe that assessing self-regulated learning processes within specific academic domains is useful for understanding student learning and for planning instructional activities that help to promote it. In the following section I compare domain-specific with general processes in the study of human behavior. I then discuss the assessment of domain-specific self-regulated learning processes, along with some measurement issues. To focus this discussion, I have concentrated on one type of process: perceived self-efficacy, or students' beliefs concerning their capabilities to organize and implement actions necessary to attain designated levels of performance (Bandura, 1986). Some empirical evidence for the predictive utility of self-efficacy during cognitive skill learning is presented, and I explain how different factors associated with students' task engagement can affect self-efficacy. The article concludes with suggestions for future research.



ERIC

## Domain-Specific and General Processes

### Prediction of Human Behavior

Personality processes. General measures of human characteristics have routinely been employed in studying personality development. Trait theorists postulated that much human behavior is governed by traits, or general and stable predispositions to act in certain ways (Allport, 1961). Presumably individuals' underlying personality structures were composed of traits that could be inferred from behaviors, and researchers compared persons and groups on trait dimensions across time and in different situations.

Empirical evidence shows that people's descriptions of their traits are generally more stable than the behaviors to which they refer (Mischel, 1968). The structure of social functioning gives the appearance of greater generality and stability than actually exists. People tend not to radically alter their physical appearance, they are regularly observed in the same situations, trait designators (e.g., dependency, aggression) are so general that they encompass a wide variety of behaviors, personality tests ask people to rate their behaviors in typical situations, and people selectively process and remember actions that are consistent with their preconceived notions of themselves.

Bem and Allen (1974) suggested that some people are more consistent than others in some behavioral domains. When researchers pool data from more- and less-consistent subjects across situations, evidence for behavioral consistency becomes muddled. Psychological theories postulating that behavior can be predicted from general traits may need to initially identify consistent individuals and the domains in which they display consistency. This view of traits clearly limits their usefulness.

Achievement-related processes. Better prediction of achievement behavior is obtained with intelligence and ability measures. Standardized intelligence tests, such as the Stanford-Binet and the WISC, have high test-retest and parallel forms reliability coefficients. Intercorrelations between measures of intelligence and school achievement are typically positive and often high (Snow & Lohman, 1984). Measures of specialized abilities (e.g., mathematics, verbal) predict student learning in the appropriate content area.

This is not to suggest that measures of general cognitive processes always predict student achievement. For example, aptitude-treatment interaction (ATI) research explores whether different learner aptitudes, or characteristics of students that are presumably preparatory to their future achievement, lead to better learning under some instructional conditions than others (Corno & Snow, 1986). Research does not always yield significant ATIs, and some significant ATIs have not been replicated (Cronbach & Snow, 1977). Complex constellations of aptitudes often predict student learning better than any aptitude alone.

Current instructional theories view learning as a complex process that involves instructional, social, and learner variables (Pintrich, Cross, Kozma, & McKeachie, 1986). Learners are active processors of information who interpret instructional and social information and influence their own learning. How learners use their knowledge, skills, and abilities, depends in part on such factors as their beliefs concerning what use they will make of the new learning, their interest in learning, their perceived capabilities for learning, and their affective reactions to their successes and failures.

General constructs are being replaced by differentiated conceptions. Factor analytic theory has replaced the unidimensional g intelligence construct with fluid (analytic), crystallized (verbal - educational), and visualization (figural - spatial) abilities (Snow & Lohman, 1984). Sternberg (1985) proposed a triarchic theory of intelligence comprising metacomponents that exert executive control, performance components that implement the plans specified by metacomponents, and knowledge acquisition components that select and encode new information. In Gardner's (1983) view, intelligence includes such aspects as language, mathematics, music and kinesthetics.

Self-concept has historically been viewed as one's collective self-perceptions formed through one's experiences with and interpretations of the environment and heavily influenced by reinforcements and evaluations by significant others. Wylie (1979) found that correlations between general self-concept and academic achievement were lower than those between academic self-concept - a more situationally specific construct - and academic achievement. Recent work characterizes self-concept as multifaceted and hierarchically organized. Self-perceptions of specific behaviors influence subarea self-concepts (e.g., English, mathematics), which combine to form the academic self-concept (Marsh & Shavelson, 1985). The general self-concept is formed by self-perceptions in the academic, social, emotional, and physical domains. Higher correlations between academic achievement and subject area self-concepts have been obtained than between achievement and academic self-concept (Shavelson & Bolus, 1982).

## Behavioral Change

Attempting to change behavior by modifying general cognitive processes can be problematic. Given that general characteristics are formed through interactions in various situations over time, brief interventions using

ERIC
Full Text Provided by ERIC

specific tasks should not have much impact. Some aspects of general abilities may prove relatively unalterable for some students (Corno & Snow, 1986).

In contrast, when students receive instruction designed to improve cognitive functioning within specific domains, their performances often improve on a variety of achievement behaviors within that domain (Schunk, in press). Domain-specific instruction might improve general cognitive functioning to the extent that students transfer their newly learned skills to a wide variety of tasks. Unfortunately, students often fail to employ skills on tasks other than those included in the instructional program (Borkowski & Cavanaugh, 1979).

This problem is especially evident in the area of cognitive strategy training. Cognitive strategies are systematic plans oriented toward improving performance (Winne, 1985). There is much evidence for successful strategy training, but less evidence of strategy generalization to other tasks (Baker & Brown, 1984). Failure to employ a strategy may result partly from the belief that, although the strategy is useful, it is not as important for success as are such factors as time available or effort expended (Schunk, 1986). Students also may believe that the strategy is useful only on tasks similar to those included in the instructional program. Conveying strategy value (i.e., that strategy use helps to promote performance on different tasks) can promote strategy transfer. One way to convey value is to train students on multiple tasks (Borkowski & Cavanaugh, 1979). As part of such training, students may need instruction on how to transform the strategy for use on other tasks, because even minor modification can be problematic.

## Measurement of Self-Regulated Learning Processes

I will illustrate the measurement of domain-specific self-regulated learning processes by discussing the assessment of self-efficacy. Much of what follows is based on a research program that I have conducted over the past few years (Schunk, 1985b, in press). This section is intended to highlight the role of self-efficacy in self-regulated learning and to offer some suggestions for researchers interested in developing other domain-specific assessments. The following section summarizes some empirical evidence.

### Conceptual Framework

Self-efficacy refers to students' beliefs concerning their capabilities to organize and implement actions necessary to attain designated levels of performance (Bandura, 1986). Self-efficacy is hypothesized to affect choice of activities. Students who hold a low sense of efficacy for accomplishing a task may avoid it, whereas those who believe they are more capable should participate more eagerly. Self-efficacy also is hypothesized to 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, 1982b).

Individuals acquire information to assess self-efficacy from their actual performances, vicarious experiences, forms of persuasion, and physiological indexes. In general, one's own successes raise self-efficacy and failures lower it, although once a strong sense of efficacy is developed an occasional failure may not have much effect. 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 self-efficacy than performance-based information, because a vicarious increase in self-efficacy can be negated by subsequent failure. Students receive persuasory information from teachers that they are capable of performing well ("You can do this"). Positive persuasory feedback can enhance self-efficacy, but this increase is apt to be short-lived if students' subsequent efforts turn out poorly. Students also derive efficacy information from physiological indexes (e.g., heart rate, sweating). Anxiety symptoms can convey that one lacks the skills necessary to perform well.

Information acquired from these sources does not influence self-efficacy automatically but rather is cognitively appraised (Bandura, 1982b). Efficacy appraisal is an inferential process in which persons weigh and combine the contributions of such personal and situational factors as their perceived ability, the difficulty of the task, amount of effort expended, amount of external assistance received, task outcomes, patterns of successes and failures, perceived similarity to models, and persuader credibility.

## Assessment of Self-Efficacy

With some modifications, I have closely followed Bandura's original model as applied to therapeutic settings. In his early work with snake phobics (Bandura & Adams, 1977; Bandura, Adams, & Beyer, 1977), subjects initially were given a behavioral avoidance test comprising increasingly more threatening interactions with a boa constrictor. The hierarchy included such tasks as looking at the snake in a cage from a distance, placing a bare hand in the cage, holding the snake with bare hands, and tolerating the snake in one's lap.

The efficacy assessment was a two-step procedure. Subjects were given a list of the tasks and designated those they believed they could perform. For each task designated, they rated the strength of their certainty on a scale ranging from high uncertainty (10) to complete certitude (100). Subjects also made similar judgments for coping successfully with an unfamiliar snake to determine the generality of self-efficacy.

In my own work I have substituted skill hierarchies for anxiety hierarchies; skill areas addressed include mathematics (division, subtraction, fractions), reading comprehension, and listening comprehension. Within any skill domain, tasks are selected and ordered in difficulty. For example, addition of fractions problems can be ordered depending on the number of terms to be added, whether one must find a lowest common denominator, the size of the lowest common denominator, and whether the answer must be reduced. Reading comprehension questions can be ordered based on the length and vocabulary level of the reading passage, and the type of skill required by the question (e.g., details, main ideas). The self-efficacy scale, along with some sample efficacy tasks, is portrayed in Table 1.

---

Insert Table 1 about here

---

I also have altered the nature of the efficacy judgmental task. In the phobic research, subjects were presented with descriptions of tasks and judged their certainty of performing each task. With cognitive skills, different tasks may tap the same skill. In subtraction, for example, the problems 53 - 27 and 64 - 36 tap the skill of regrouping once in two-column problems. For each efficacy judgment on cognitive skill tasks, students are presented with sample problems or questions for a brief time period (e.g., 5 sec) that is long enough to determine the type of problem or question but too short to



ERIC

attempt mental answers. Students judge their certainty for correctly solving problems or answering questions of that type; that is, problems or questions comparable in difficulty, length, form, and so on. They do not judge whether they can solve any particular problem or answer any particular question. Children make only one efficacy judgment for each type of task portrayed, because early pilot work showed that they found the two-step judgment procedure confusing.

In recent studies, we also have assessed self-efficacy for learning: Subjects judge their capabilities for learning to solve types of problems or answer types of questions, rather than their certainty for being able to successfully perform those tasks. In the phobic research, such activities as approaching and touching a snake involve behaviors that people know how to perform but typically do not because of anxiety and negative outcome expectancies (e.g., "If I get near the snake, it will bite me"). In contrast, most school activities involve learning. Students acquire declarative knowledge in the form of facts, scripts (e.g., events of a story), and organized passages (the Declaration of Independence); procedural knowledge (concepts, rules, algorithms); and conditional knowledge, or knowledge of when and why to employ forms of declarative and procedural knowledge (Paris, Lipson, & Wixson, 1983).

Self-efficacy for learning is hypothesized to be an important process involved in self-regulated learning (Schunk, 1986). In assessing learning capabilities, students take into account what they will need to learn, what knowledge and skills are prerequisites for the new learning, how well they remember the prerequisite information, how easily they have learned similar skills in the past, how well they can attend to the teacher's instruction and rehearse material to be learned, and how skillfully they can monitor their level of understanding. Students who feel more efficacious about learning ought to engage in such activities as attending to instruction, rehearsing material to be learned, and monitoring level of understanding. In turn, as students perceive that they are acquiring skills and knowledge, they should believe that they are capable of further learning.

## Measurement Issues

*Reliability*. Reliabilities of the various self-efficacy assessments have been determined by administering the test to students not participating in the actual study on two occasions separated by several days to preclude item recall. Some sample reliability coefficients are as follows: division of whole numbers, $r = .85$ (Schunk & Gunn, 1986); subtraction of whole numbers, $r = .82$ (Bandura & Schunk, 1981); addition and subtraction of fractions, $r = .79$ (Schunk, Hanson, & Cox, in press); reading comprehension (main ideas), $r = .82$ (Schunk & Rice, in press).

Kirsch and his colleagues (Kirsch, 1980; Kirsch & Wickless, 1983) contend that self-efficacy tests constitute Guttman scales because: (a) Items are ordered in level of difficulty; (b) Each item can be scored as a pass or fail; and (c) The first failure in the series implies that the respondent passed all preceding items and failed all subsequent ones (Nie, Hull, Jenkins, Steinbrenner, & Bent, 1975). The number of items that the respondent passed determines the pattern of responses; thus, if a respondent passed 10 items on a 20-item test, then the respondent passed the first 10 items. Use of the test-retest procedure with Guttman scales would be inappropriate because it would produce artificially high reliability coefficients. (For a discussion of statistics used to assess reliability of Guttman scales, readers should consult Nie et al.).

Cognitive skill self-efficacy tests satisfy the first two criteria but not the third. Items are ordered in terms of objective difficulty. In some studies, a cutting point separating high and low efficacy judgments has been established (Bandura & Schunk, 1981; Schunk, 1981). The third criterion assumes a perfectly ordered task hierarchy. Although tasks are ordered based on objective difficulty, students do not generally perceive them the same way. Bandura (1980) notes that some subjects judge themselves more capable of tolerating a snake in their laps than holding it in front of their faces, although the former task ought to provoke greater anxiety.

With cognitive skills, disparities between objective difficulty and students' efficacy judgments occur because they do not fully understand what skills are required to accomplish the task. For example, many children who lack regrouping skills judge self-efficacy higher for solving problems of the type 9003 - 6571 than for solving 968243 - 657121. They believe that one simply subtracts the smaller number from the larger number in each column; thus, the former problem appears easier because it has fewer columns. In fact, the former is more difficult because it requires regrouping across zeros. In summary, there is no evidence to support the idea that self-efficacy tests constitute Guttman scales.

Validity. With respect to content validity, we have developed self-efficacy tests in conjunction with the instructional program that participating students receive. From 50-70% of the self-efficacy tasks (problems, questions) correspond in form and difficulty to tasks included in the instructional program. The remaining tasks are slightly more complex and



ERIC

are included to assess generality. In subtraction, for example, students receive instruction on regrouping in two columns. Some self-efficacy judgments require regrouping in three columns.

During the instructional program, much time is devoted to independent practice (i.e., students work alone). Criterion-related validity of self-efficacy for learning can be assessed by relating it to students' actual performances. Another useful index is obtained by relating students' posttest self-efficacy judgments to their subsequent performances on the skill test. As will be discussed in the next section, self-efficacy and skill typically bear a positive and significant relationship to one another.

Construct validity has been assessed in various ways. Our empirical studies have tested many theoretical propositions (Bandura, 1982b, 1986; Schunk, 1985b). We should expect that self-efficacy would bear strong relationships with such factors hypothesized to influence it as students' attributions, or perceived causes for their successes and failures (Weiner, 1985). Higher self-efficacy judgments should be associated with greater emphasis on ability and effort as causes of success and with lower judgments of task difficulty. This pattern of significant correlations has been obtained (Schunk, 1981; Schunk & Cox, 1986). Consistent with prediction, we also have found that as skills develop, the correlation between self-efficacy and ability attributions increases (Schunk & Gunn, 1986).

Given the domain specificity of self-efficacy, we should expect that self-efficacy would correlate higher with other domain-related measures than with measures of general cognitive functioning. Schunk (1981) found significant and positive correlations between students' self-efficacy judgments for solving division problems and their self-judged attitudes toward



ERIC

division; self-efficacy also related positively to observers' ratings of students' persistence on division problems and effort expenditure. In contrast, no relationship was obtained between self-efficacy and students' locus of control scores, or the extent to which children took personal responsibility for their academic successes and failures. Positive but nonsignificant correlations were obtained between self-efficacy and standardized measures of mathematical competence. These latter correlations are partly artifactual, because students' were working below grade level in mathematics and their standardized scores were uniformly low.

Demand characteristics. It is possible that demand characteristics of the experimental setting could influence subjects' efficacy judgments. When subjects make public statements concerning their perceived capabilities, they then might believe that they must live up to such public expectations, which could boost their performances (Bandura, 1982a; Dweck & Gilliard, 1975). To preclude this unwanted source of social influence from affecting efficacy judgments, students in our studies make their efficacy judgments privately. They are told prior to the assessment that their work will not be shown to others in the school or to their parents, and that they will receive no grades for their work. They also are advised to answer the questions honestly and to mark how they really feel.

Another type of demand characteristic involves offering subjects motivational inducements for higher performance. Kirsch (1982) found that offering subjects rewards can alter self-efficacy judgments. Motivational inducements may affect self-efficacy judgments for tasks involving previously learned actions, but it is difficult to see how offering rewards could influence efficacy judgments in contexts involving learning. When subjects know that they lack skills, no amount of motivational inducement can lead them to believe otherwise.

## Empirical Evidence

### Self-Efficacy for Learning

Two recent studies investigated the role of peer modeling during cognitive skill learning (Schunk & Hanson, 1985; Schunk et al., in press). Children who had experienced some difficulties learning mathematical skills in their classes were pretested on self-efficacy and skill (subtraction with regrouping - Schunk and Hanson; addition and subtraction of fractions - Schunk et al.). Children then observed videotapes portraying one or more peer (student) models learning to solve problems, after which subjects judged self-efficacy for learning. Students received instruction and practice over the next several sessions, and were posttested on completion of the instructional program.

The predictive utility of self-efficacy was determined by relating self-efficacy for learning to the number of problems that children completed during the independent practice time. Significant ($ps < .01$) and positive correlations were obtained: $r = .42$ (Schunk & Hanson, 1985); $r = .38$ (Schunk et al., in press, Experiment 1); $r = .33$ (Experiment 2). More rapid problem solving was not attained at the expense of accuracy. Similar correlations were obtained by using the proportion of problems that students solved correctly (total number correct divided by total number completed) as the measure of self-regulated learning. Self-efficacy for learning also related positively and significantly to posttest self-efficacy and skill (range of $rs = .46 - .90$).

Self-Efficacy and Performance

The predictive utility of pretest self-efficacy is often inadequate because subjects lack skills and judge self-efficacy low. In contrast, there is greater variability in posttest measures of self-efficacy and skill. The relationship of these measures has been assessed in various domains. In the last three years, for example, we have used mathematical division (Schunk, 1984a; Schunk & Gunn, 1985, 1986), subtraction with regrouping (Schunk, 1984b, 1985a; Schunk & Cox, 1986; Schunk & Hanson, 1985), addition and subtraction of fractions (Schunk et al., in press), listening comprehension (Schunk & Rice, 1984), reading comprehension (Schunk & Rice, 1985, 1986, in press). In each of these studies, posttest self-efficacy bore a positive and significant relationship to posttest skill (range of *r*s = .27 to .84).

We also have employed multiple regression to determine the percentage of variability in skillful performance accounted for by self-efficacy (Schunk, 1981, 1982; Schunk & Gunn, 1986). These analyses show that perceived efficacy accounts for a significant increment in the variability in posttest skill; the $R^2$ values range from .17 - .24. Schunk (1981) also employed path analysis to test how well a causal model of achievement reproduced the original correlation matrix. The correlation matrix comprised instructional treatment, self-efficacy, persistence, and skill. The most parsimonious model that reproduced the data showed that: (a) Treatment exerted both a direct effect on skill as well as an indirect effect through persistence and self-efficacy, (b) The effect of treatment on persistence operated indirectly through self-efficacy, and (c) Self-efficacy influenced skill and persistence.

In two studies (Bandura & Schunk, 1981; Schunk, 1981), the congruence between self-efficacy and skill was determined at the level of individual tasks. Each posttest efficacy judgment was compared with the subsequent accuracy score on the problem of comparable form and difficulty. Congruence was defined as students judging themselves capable (incapable) of solving that type of problem on the efficacy test and then solving (not solving) the comparable problem on the skill test. The criterion for an efficacious judgment was set at the mid-range of the scale (i.e., moderate assurance). Congruence percentages range from 51 - 85 percent.

Bandura (1982b) contends that higher self-efficacy leads to greater persistence. We have explored the relationship between posttest self-efficacy and the length of time that students subsequently spend working problems. Studies have yielded mixed results: $r = .30$ (Schunk, 1981); $r = -.29$ (Schunk & Hanson, 1985). The relationship of self-efficacy to persistence may depend on task difficulty and students' level of skill development. When skills are ill-formed and self-efficacy is low, students may spend some time on problems but not solve them. As skills and self-efficacy develop, students may actually spend less time on problems but solve them correctly. Persistence may bear the best relationship to self-efficacy when the task is insolvable or sufficiently difficult such that students with low self-efficacy will quit readily whereas those who feel more competent will persevere because they believe they can master it.

Self-Efficacy During Task Engagement

Similar to other self-regulated learning processes, self-efficacy influences what students learn in school, and is itself affected by students' learning. I previously have discussed this reciprocal relationship between self-efficacy and self-regulated learning (Schunk, 1985b, 1986, in press). This model, which was derived from theories of learning, motivation, and instruction (Bandura, 1986; Corno & Mandinach, 1983; Nicholls, 1983; Weiner, 1985; Winne, 1985), hypothesizes that students enter learning situations with an initial sense of self-efficacy for learning that is a function of aptitudes and prior experiences. For example, students with higher verbal ability may be more confident about performing well on language tasks than those with lower verbal ability. Students who previously have performed well in a content area ought to believe that they are capable of further learning in that area, whereas students who have experienced difficulties may doubt their capabilities.

During instructional activities, students derive cues that signal how well they are learning and that they use to appraise their self-efficacy for continued learning. These cues include performance outcomes, outcome patterns, attributions, contextual cues, similarity to models, persuader credibility, and bodily symptoms. Factors associated with students' task engagement can make certain cues more salient than others. Some of these factors are as follows. The _purpose of instruction_, or what uses students will make of the material to be learned; the _difficulty of the content_; the type of _cognitive processing_ required to master the content; the amount and type of _strategy training_ given to students to help them master the content; the manner and clarity of _instructional presentation_; _performance feedback_ to students concerning how well they are learning; the type of _modeling_ presented by teachers and other students; _goal setting_ and students' evaluations of their goal progress; the type of _rewards_ given and what they are given for; and the type of _attributional feedback_ students receive for their performances.

We have explored the effects of many of these factors. For example, proximal performance goals, which are close at hand, lead to higher self-efficacy, task motivation, and skillful performance, compared with temporally distant goals (Bandura & Schunk, 1981). Proximal goals are hypothesized to convey clearer information to students concerning their progress in learning. Ability attributional feedback given for early successes during cognitive skill learning enhances self-efficacy and skillful performance more than effort feedback (Schunk, 1984b). The perception of less initial effort required for learning can lead one to believe that one is capable of further learning. Observing a peer learn mathematical skills instills higher self-efficacy for learning than does observing a teacher model (Schunk & Hanson, 1985). Students are apt to believe that if the peer can learn, they can as well, whereas they might believe that the teacher is highly competent.

Collectively, this research shows that task variables conveying to students that they are improving their skills lead to higher self-efficacy and greater efforts directed toward learning. By conducting research on self-regulated learning in different content areas, we have studied the development of self-efficacy and skills as it typically occurs in school.

## Future Research

As I noted at the outset, I believe that assessing domain-specific self-regulated learning processes is useful for understanding how students learn and for planning instructional activities that help to promote self-regulated learning. Operating from a cognitive psychology framework, researchers are conducting exciting investigations on students' processing of information during instructional activities (Pintrich et al., 1986).

Motivational research is increasingly focusing on how student motivation influences learning within various instructional contexts (Dweck, 1986).

With respect to self-efficacy research, I would urge greater emphasis on assessing self-efficacy at the outset of learning tasks, followed by periodic reassessments to determine how students' efficacy beliefs change as they participate in instructional activities. This research not only would help clarify our understanding of the role of self-efficacy during self-regulated learning but also would have important implications for teaching. Teachers who promote a positive classroom climate in which students expect to do well may foster better learning in part because students hold higher initial expectations for success. In turn, these perceptions are validated as students subsequently succeed at tasks.

A second research problem is how students weigh and combine sources of efficacy information, especially when they conflict. As students work on tasks, they gain efficacy information directly from their own accomplishments. They also observe their peers' performances. Teachers periodically provide persuasory information as they monitor students' efforts (e.g., "You can do better"). Information from these sources may not be consistent. A student may perform poorly, but observe peers succeed and be given positive persuasory information by the teacher. We might expect that actual performance information would be weighed more heavily than other sources, but perhaps observing several peers succeed would enhance self-efficacy despite prior failures. Clearly such research would have important teaching implications for promoting students' self-regulated learning as well as their beliefs for effectively applying the skills and knowledge they already possess to produce additional learning.

References

Allport, G. W. (1961). _Pattern and growth in personality_. New York: Holt, Rinehart & Winston.

Baker, L., & Brown, A. L. (1984). Metacognitive skills and reading. In P. D. Pearson (Ed.), _Handbook of reading research_ (pp. 353-394). New York: Longman.

Bandura, A. (1980). Gauging the relationship between self-efficacy judgment and action. _Cognitive Therapy and Research_, _4_, 263-268.

Bandura, A. (1982a). The assessment and predictive generality of self-percepts of efficacy. _Journal of Behavior Therapy and Experimental Psychiatry_, _13_, 195-199.

Bandura, A. (1982b). Self-efficacy mechanism in human agency. _American Psychologist_, _37_, 122-147.

Bandura, A. (1986). _Social foundations of thought and action: A social cognitive theory_. Englewood Cliffs, NJ: Prentice-Hall.

Bandura, A., & Adams, N. E. (1977). Analysis of self-efficacy theory of behavioral change. _Cognitive Therapy and Research_, _1_, 287-310.

Bandura, A., Adams, N. E., & Beyer, J. (1977). Cognitive processes mediating behavioral change. _Journal of Personality and Social Psychology_, _35_, 125-139.

Bandura, A., & Schunk, D. H. (1981). Cultivating competence, self-efficacy, and intrinsic interest through proximal self-motivation. _Journal of Personality and Social Psychology_, _41_, 586-598.

Bem, D. J., & Allen, A. (1974). On predicting some of the people some of the time: The search for cross-situational consistencies in behavior. _Psychological Review_, _81_, 506-520.

Borkowski, J. G., & Cavanaugh, J. C. (1979). Maintenance and generalization of skills and strategies by the retarded. In N. R. Ellis (Ed.), Handbook of mental deficiency, psychological theory and research (2nd ed., pp. 569-617). Hillsdale, NJ: Erlbaum.

Corno, L., & Mandinach, E. B. (1983). The role of cognitive engagement in classroom learning and motivation. Educational Psychologist, 18, 88-108.

Corno, L., & Snow, R. E. (1986). Adapting teaching to individual differences among learners. In M. C. Wittrock (Ed.), Handbook of research on teaching (3rd ed., pp. 605-629). New York: Macmillan.

Cronbach, L. J., & Snow, R. E. (1977). Aptitudes and instructional methods. New York: Irvington.

Dweck, C. S. (1986). Motivational processes affecting learning. American Psychologist, 41, 1040-1048.

Dweck, C. S., & Gilliard, D. (1975). Expectancy statements as determinants of reactions to failure: Sex differences in persistence and expectancy change. Journal of Personality and Social Psychology, 32, 1077-1084.

Gardner, H. (1983). Frames of mind: The theory of multiple intelligences. New York: Basic Books.

Kirsch, I. (1980). "Microanalytic" analyses of efficacy expectations as predictors of performance. Cognitive Therapy and Research, 4, 259-262.

Kirsch, I. (1982). Efficacy expectations or response predictions: The meaning of efficacy ratings as a function of task characteristics. Journal of Personality and Social Psychology, 42, 132-136.

Kirsch, I., & Wickless, C. V. (1983). Concordance rates between self-efficacy and approach behavior are redundant. Cognitive Therapy and Research, 7, 179-188.

Marsh, H. W., & Shavelson, R. (1985). Self-concept: Its multifaceted, hierarchical structure. Educational Psychologist, 20, 107-123.

Mischel, W. (1968). Personality and assessment. New York: Wiley.

Nicholls, J. G. (1983). Conceptions of ability and achievement motivation: A theory and its implications for education. In S. G. Paris, G. M. Olson, & H. W. Stevenson (Eds.), Learning and motivation in the classroom (pp. 211-237). Hillsdale, NJ: Erlbaum.

Nie, N. H., Hull, C. H., Jenkins, J. G., Steinbrenner, K., & Bent, D. H. (1975). Statistical package for the social sciences (2nd ed.). New York: McGraw-Hill.

Paris, S. G., Lipson, M. Y., & Wixson, K. K. (1983). Becoming a strategic reader. Contemporary Educational Psychology, 8, 293-316.

Pintrich, P. R., Cross, D. R., Kozma, R. B., & McKeachie, W. J. (1986). Instructional psychology. Annual Review of Psychology, 37, 611-651.

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

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

Schunk, D. H. (1984a). Enhancing self-efficacy and achievement through rewards and goals: Motivational and informational effects. Journal of Educational Research, 78, 29-34.

Schunk, D. H. (1984b). Sequential attributional feedback and children's achievement behaviors. Journal of Educational Psychology, 76, 1159-1169.

Schunk, D. H. (1985a). Participation in goal setting: Effects on self-efficacy and skills of learning disabled children. Journal of Special Education, 19, 307-317.

Schunk, D. H. (1985b). Self-efficacy ard classroom learning. Psychology in the Schools, 22, 208-223.

Schunk, D. H. (1986). Verbal_zation and children's self-regulated learning. Contemporary Education Psychology, 11, 347-369.

Schunk, D. H. (in press). -efficacy and performance. In R. E. Ames & C. Ames (Eds.), Research on motivation in education (Vol. 3). Orlando: Academic Press.

Schunk, D. H., & Cox, P. D. (1986). Strategy training and attributional feedback with learning disabled students. Journal of Educational Psychology, 78, 201-209.

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

Schunk, D. H., Hanson, A. R., & Cox, P. D. (in press). Peer model attributes and children's achievement behaviors. Journal of Educational Psychology.

Schunk, D. H., & Gunn, T. P. (1985). Modeled importance of learning strategies: Effect on children's achievement outcomes. Journal of Early Adolescence, 5, 247-258.

Schunk, D. H., & Gunn, T. P. (1986). Self-efficacy and skill development: Influence of task strategies and attributions. Journal of Educational Research, 79, 238-244.

Schunk, D. H., & Rice, J. M. (1984). Strategy self-verbalization during remedial listening comprehension instruction. Journal of Experimental Education, 53, 49-54.

Schunk, D. H., & Rice, J. M. (1985). Verbalization of comprehension strategies: Effects on children's achievement outcomes. Human Learning, 4, 1-10.

Schunk, D. H., & Rice, J. M. (1986). Extended attributional feedback: Sequence effects during remedial reading instruction. Journal of Early Adolescence, 6, 55-66.

Schunk, D. H., & Rice, J. M. (in press). Enhancing comprehension skill and self-efficacy with strategy value information. Journal of Reading Behavior.

Shavelson, R. J., & Bolus, R. (1982). Self-concept: The interplay of theory and methods. Journal of Educational Psychology, 74, 3-17.

Snow, R. E., & Lohman, D. F. (1984). Toward a theory of cognitive aptitude for learning from instruction. Journal of Educational Psychology, 76, 347-376.

Sternberg, R. J. (1985). Beyond IQ. Cambridge, MA: Cambridge University Press.

Weiner, B. (1985). An attributional theory of achievement motivation and emotion. Psychological Review, 92, 548-573.



ERIC

Winne, P. H. (1985). Cognitive processing in the classroom. In T. Husen & T. N. Postlethwaite (Eds.), The international encyclopedia of education (Vol. 2, pp. 795-808). Oxford, England: Pergamon Press.

Wylie, R. C. (1979). The self-concept (Vol. 2). Lincoln, NE: University of Nebraska Press.

Zimmerman, B. J. (1986). Becoming a self-regulated learner: Which are the key subprocesses? Contemporary Educational Psychology, 11, 307-313.



ERIC

Table 1

Sample Self-Efficacy Scale and Questions

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 |
| sure | | | Maybe | | | Pretty sure | | | Really sure |

| | |
|---|---|
| + 3/7 = | 1/2 + 1/2 + 2/8 = |
| + 1/4 = | 2/6 + 5/18 + 1/12 = |
| - 4/6 = | 5/6 - 4/6 = |
| - 2/4 = | 4/5 - 1/5 = |
| - 1/5 = | 7/12 - 2/6 = |
| - 5/6 = | 7/8 - 2/4 |