Identifying and Remediating Students'

Inefficient Approaches to Tasks

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Running Head: Inefficient Approaches to Tasks

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Effective learners are self-regulating. They analyze task requirements, set productive learning goals, select, adapt, or even invent strategies to achieve their objectives, monitor progress as they work through tasks, manage intrusive emotions and waning motivation, and adjust strategic approaches adaptively to foster success (Butler & Winne, 1995; Corno, 1993; Zimmerman, 1989; 1994). In contrast, students with learning disabilities have been characterized as actively inefficient in their approaches to tasks (Swanson, 1990). Although these students often invest considerable effort in learning, they appear to have difficulty focusing their learning efforts effectively (Butler, 1998-d). This paper presents evidence suggesting that the learning inefficiencies of adult students with learning disabilities derive from ineffective self-regulation. Specifically, combined evidence from seven studies suggests that these students' successful performance often is undermined by a combination of inaccurate metacognitive knowledge, negative motivational beliefs, intrusive emotions such as frustration and anxiety, and faulty self-regulated processing. This paper also describes an instructional model that has been shown to promote self-regulated learning by adult students with learning disabilities, the Strategic Content Learning (SCL) approach. Finally, implications for theory and practice are described.

A Simplified Model of Self-Regulated Learning

To provide a framework for characterizing students' difficulties with self-regulated processing (and for explaining the SCL approach), a simplified model of self-regulated learning is presented in Figure 1 (Butler, 1998-a; Butler & Winne, 1995; Carver & Scheier, 1990; Corno, 1986, 1993, 1994; Zimmerman, 1989, 1994, 1995). This model suggests that, when faced with an academic task, self-regulated learners start by analyzing task demands. Next, they select, adapt, or even invent strategic approaches to meet particular objectives. In essence, effective self-regulation requires coordinating strategy use in light of perceived task requirements (Butler, 1998-a; Wong, 1985, 1991). Once they have implemented strategies, self-regulated learners self-monitor progress. They do this by comparing outcomes to goals and generating internal feedback about discrepancies (Butler & Winne, 1995). Based on their perceptions of progress, self-regulated learners make deliberate decisions about how to proceed. Finally, self-regulated learners also have developed strategies for preventing and/or overcoming negative emotions and waning motivation (Corno, 1993, 1994).

Students' approaches to self-regulation also are influenced by knowledge and beliefs that they bring to learning tasks. These include students' metacognitive knowledge about tasks, strategies, monitoring, and themselves as learners (Butler, 1998-c; Wong, 1991), and motivational beliefs such as attributions for successful and unsuccessful performance and perceptions of self-efficacy (Bandura, 1993; Borkowski, 1992; Schunk, 1994). It follows, then, that effective self-regulation is a complex endeavor. Effective self-regulation requires that students flexibly and recursively engage in a cycle of cognitive activities (e.g., analyzing tasks, setting goals, implementing strategies, self-evaluating, self-monitoring), informed by a range of knowledge and beliefs (e.g., conceptions about tasks, knowledge about strategies, attributions, perceptions of self-efficacy), to manage cognition, motivation, and volition.

It also follows that, if students experience difficulties with any of these aspects of self-regulation, then their successful learning may be undermined. For example, inaccurate analysis of task demands has the potential to derail the effectiveness of all learning activities (Butler, 1995; Wong, 1985). This is because learners' perceptions of task requirements influence the goals that they set, their choice of strategic approaches, and the criteria they set for judging their success in learning (Butler & Winne, 1995). If students misinterpret a task's purpose, even active and reflective learners will self-direct learning inefficiently. And, students' effective task analysis can be threatened if they do not invest effort to decipher task requirements, possess inaccurate metacognitive understandings about typical tasks, and/or have difficulty interpreting assignment demands. Unfortunately, prior research suggests that students with learning disabilities are likely to experience difficulties in one or more of these areas (Butler, 1998; Englert, 1990; O'Shea & O'Shea, 1994; Wong, 1985, 1991).

Insert Figure 1 about here

Students' learning also can be undermined if they do not select and implement effective cognitive or metacognitive strategies. This is again a difficulty that has been observed for students with learning disabilities (see Butler, 1998-c; Englert, 1990; Englert, Raphael, Anderson, Gregg, & Anthony, 1989; Montague, Maddux, & Dereshiwsky, 1990; Swanson, 1990). Problems with students' use of strategies may be linked to incomplete metacognitive knowledge, difficulties in selecting strategies that match task demands, and/or a lack of effort invested in implementing strategies (Butler & Winne, 1995). Students' willingness to invest effort in learning may be threatened by low-confidence or by students' beliefs that they have little control over outcomes (Bandura, 1993; Schunk, 1994).

As a final example, ineffective self-monitoring, like task analysis, can thwart students' success. Butler and Winne (1995) have argued that monitoring is the "hub" about which successive cycles of self-regulated processing turn, because it is when students judge outcomes in relation to goals that they make decisions about how to guide further learning. Unfortunately, research suggests that students with learning disabilities may be at risk for ineffective monitoring as well (e.g., Baker & Brown, 1984; Van Haneghan & Baker, 1989). These difficulties can stem from a lack of awareness of the importance of monitoring, adopting ineffective criteria for evaluating performance (often linked to poor task analysis), or having little sense of how to refocus efforts if problems are encountered (Butler & Winne, 1995).

This brief summary emphasizes that understanding the difficulties of students' with learning disabilities requires more than assessing the kinds of basic cognitive processes typically associated with learning disabilities (e.g., deficits in language-based processes such as phonological coding; Mann, 1998). Instead, it also is critical to identify problems in students' self-regulated approaches to tasks and in the metacognitive knowledge and motivational beliefs that can either support and/or undermine learning (Butler & Winne, 1995; Harris & Graham, 1996; Zimmerman, 1995).

To highlight the importance of attending to and remediating student's naive approaches to self-regualtion, in this paper two types of evidence are summarized. First, based on data accumulated across 7 studies (through a combination of questionnaires, interviews, and observations), difficulties that undermine effective self-regulation by adult students with learning disabilities will be described. Second, evidence will be summarized showing that instruction targeted at supporting self-regulated performance promotes academic success. Taken together, these two sources of evidence underline the importance of assessing and supporting self-regulated learning when priorizing interventions for these students.

A Summary of SCL Research

To date, 7 intensive intervention studies have been completed evaluating SCL efficacy for students with learning disabilities in postsecondary settings. Across these studies, SCL has been adapted for use in the three most common service delivery models employed in colleges and universities. In four studies (N = 35), SCL was implemented as a model for individualized tutoring by learning specialists, counsellors, or teachers (see Butler, 1992, 1993, 1995, 1998-a, 1998-d). In another two studies (N = 14), SCL served as a model for peer tutor training (see Butler, Poole, MacLeod, & Syer, 1997). The seventh study (n = 13) investigated SCL when adapted for use within small group discussions as part of a study skills course (see Butler, Poole, Elaschuk, Cuddy, & Novak, 1999). Thus, across studies, 62 students have participated in interventions where they received support following the SCL model. In addition, pretest data have been collected from 28 additional students who did not participate in SCL interventions. Thus, for the purposes of analyzing students' naive approaches to self-regulated learning, data from 90 participants were available.

Insert Figure 2 about here

In each study on SCL efficacy, a common research design was employed (see Figure 2). First, to trace the relationship between instructional activities and students' development of self-regulation, in-depth case study data were collected for each participant (Merriam, 1988; Yin, 1994). At the same time, multiple case studies were embedded within a pre-post design. During pre- and posttest sessions, parallel questionnaires, observations, and interviews were employed to measure common effects across students (see Butler, 1993, 1995, 1998-d).

Participants in all studies were students enrolled in colleges or Universities. Psycho-educational assessments verified that students had learning disabilities (based on discrepancy definitions used at the various institutions), although students' specific learning disabilities affected different aspects of their performance. Further, many students experienced concomitant disabilities that also affected their learning (e.g., a visual impairment or attention deficit disorder). Participants were enrolled in a broad range of programs. Some focused on basic academic upgrading (e.g., for math at the fifth grade level). Other students were enrolled in vocational (e.g., in Early Childhood Education, Medical Lab Technician, or Diesel Mechanics), academic (e.g., University transfer; 1st year University courses), or professional (e.g., Law, Education) programs. Thus, a heterogeneous group of students participated across the 7 studies. This diversity has facilitated evaluating the robustness of the SCL model across students, settings, programs, and tasks.

In postsecondary settings, SCL instruction has been provided as an adjunct to regular classroom instruction. In the individualized tutoring and peer tutor studies, students chose the tasks that they wanted to work on (typically variants of reading, writing, studying, and math tasks), and the assignments addressed were drawn from individuals' programs of study. In the group-based study skills course, all groups worked either on reading and studying or on writing tasks, but task examples still were drawn from participants' actual work. Thus, at each meeting, students priorized assignments based on current course requirements, and SCL tutors provided calibrated assistance as students self-regulated completion of those tasks. In all studies, instructors generally met with students (as individuals or in small groups) two to three times per week (for two to four hours per week) over the course of at least a single semester. Information on participants' ages, gender, and, where applicable, participation in SCL interventions (i.e., number of intervention sessions, total time involved) is presented in Table 1.

Insert Table 1 about here

Inefficiencies in Students' Self-Regulated Approaches to Tasks

In this section, analyses of pretest data for 90 students are summarized to characterize inefficiencies in students' self-regulated approaches to tasks. At pretest, data on students' metacognitive knowledge, motivational beliefs, emotional responses, and self-regulated approaches were gathered using a variety of complementary strategies. An overview of data collection strategies is provided below (detailed descriptions are available elsewhere; see Butler 1993, 1995, 1998-d).

<u>Metacognitive Knowledge</u>. Students' metacognitive knowledge was assessed in three ways: (1) using a Metacognitive Questionnaire (adapted from Graham & Harris, 1989; Wong, Wong, & Blenkinsop, 1989, see Butler, 1995), (2) within a Strategy Interview, and (3) during observations of students' completion of tasks (see below). For the questionnaire and interview measures, common criteria were used to evaluate students' metacognitive understandings across four dimensions: (a) task description (students' conceptions of task requirements), (b) strategy description (the clarity of students' descriptions of task-specific strategies), (c) strategy focus (the degree to which described strategies were focused, personalized, and *connected to task demands*), and (d) monitoring (students' descriptions of how they self-evaluate progress and manage learning activities accordingly). Scores were also generated for two additional metacognitive dimensions when students spontaneously made comments relevant to them (since questions on both measures were open enough to allow for comments in these areas, but did not target them specifically). These additional dimensions were (e) expressed confidence and (f) volition control (knowledge of emotional or motivation challenges and of possible volition control strategies) (see MacLeod, Butler, & Syer, 1996; Butler, 1998-d for details regarding scoring criteria).

<u>Self-Efficacy</u>. In each study, multiple questionnaires also were used to assess students' perceptions of self-efficacy (note that the scales included within some questionnaires differed across studies). The Self-Efficacy Questionnaire (adapted from Graham & Harris, 1989; Wong et al., 1989, see Butler, 1995, 1998-d) contained scales that assessed students': (1) perceptions of global self-efficacy (e.g., "I am a self-reliant person"); (2) confidence in their ability to complete task-specific skills (e.g., the ability to organize ideas while writing); (3) self-perceptions of competence on task-specific skills (i.e., how easy or difficult they found task-specific skills to be); and/or (4) preferences for a targeted task (e.g., how much they like writing). The Metacognitive Questionnaire contained one item that asked students to rate their ability on chosen tasks. Finally, the Self-Efficacy Across Tasks Questionnaire asked students to rate (1) how much difficulty they experienced with the task targeted for intervention; and (2) how much difficulty they experienced with a range of other academic tasks.

<u>Attributions</u>. Students' attributions for successful and unsuccessful performance were assessed using one questionnaire with two sections. Students were asked to think of "the last time" they were successful (or, in the next section, unsuccessful) at completing their targeted tasks, and to rate the relative importance of a number of factors to their level of performance: ability, strategy use, effort, relying on help provided by others vs. strategic help seeking, and luck (Groteluschen & Hale, 1990; Relich, Debus, & Walker, 1986; Schunk & Rice, 1986; Weiner, 1974).

<u>Students' Self-Regulated Approaches to Tasks</u>. Students' self-regulated approaches were assessed during pretest interviews and initial intervention sessions. During the pretest strategy interview, students were asked to complete their targeted task "as they normally would" and to think-aloud in the process. Students' descriptions of their approaches to tasks were transcribed, and their approaches to

learning were documented. Similarly, during early intervention sessions, students were initially observed completing tasks without assistance in order to gauge students' problem areas and build on their current approaches to learning. All interactions were tape recorded, traces of students' performance were collected (e.g., notes, outlines, highlighted text), field notes were maintained to document instructors' observations, and students' verbal descriptions of strategies were transcribed verbatim.

For the purposes of this paper, these data were systematically analyzed. To begin, a table was constructed for each study that listed each students' data in a separate row. The first column of the table included the students' name. The second column included a set of codes designed to cue researchers to look systematically in five areas while reviewing students' files. These areas matched the dimensions scored in the metacognitive measures and included (1) task understanding, (2) strategy understanding and implementation, (3) monitoring, (4) motivational beliefs, and (5) emotions and volition control. Next, one researcher examined responses to the metacognitive questionnaires, transcripts of strategy interviews, field notes, students' strategy records, and traces of students' strategy use to identify problem areas experienced by students in their self-regulated processing. She recorded a general description of each area of difficulty in one column, and then used the next column to record the specific evidence on which the problem description was based (e.g., a specific quote from a field note or an excerpt from a questionnaire). Next, a second researcher independently added another column to the table that cross-referenced quantitative scores on the metacognitive questionnaire and strategy interview to the description of problems derived from the qualitative review of the data. This researcher also carefully examined each student's file to double check and flesh out the first researcher's entries, considering all dimensions of self-regulated processing, but with particular attention to dimensions on which students received low scores on the quantitative metacognitive measures. This combination of approaches was used to insure that the qualitative summary of students' problems in self-regulated processing was reliable, valid, and comprehensive. Finally, a third researcher reviewed and categorized the data from the summary tables to characterize the types of difficulties students experienced within each of the five general areas.

Results

Mean scores and standard deviations from pretest questionnaires and interviews are presented in Table 2. More specific analyses focused on each aspect of students' self-regulated performance are described in more detail below.

Insert Table 2 about here

Motivational Beliefs: Self-Efficacy and Attributions

Self-Efficacy. In order to uncover the qualities of students' perceptions of self-efficacy, distributions of students' mean scores for the self-efficacy scales were examined. Note that students' subscale scores generally represented an average rating across 6 to 10 items per scale. (The one exception was student's ability rating, which was assessed with just one item on the metacognitive questionnaire). For each scale, responses were scored on a scale from 1 to 5, where 5 represented the most positive feelings of self-efficacy (e.g., "very confident", "not a problem", "very good ability") and scores of and 3 generally represented an average rating (e.g., "somewhat confident", "somewhat of a problem", or "average ability").

Figure 3 graphically presents the distribution of individuals' scores. Note that, for this measure, we used conservative criteria for categorizing students' data as reflecting high or low self-efficacy. Positive perceptions of self-efficacy were associated with means of 3.25 or above. This cut-off was selected based on a comparison with data from another study wherein a sample of 186 1st- and 2nd-year undergraduate students completed the confidence and self-perceptions subscales from the Self-Efficacy Questionnaire (see Poole & Butler, 1999; Poole, 1999). In that study, students' mean score (on the two scales combined) was 3.28 (SD = .62). In contrast, we judged self-efficacy to be low if mean scores were 2.50 or below. To illustrate that many students had even more serious problems with self-efficacy, in Figure 3 we also present the percentage of students whose *average* scores on each scale were less than or equal to 2.00.

Insert Figure 3 about here

Interpretation of Figure 3 suggests that relatively few postsecondary students with learning disabilities experience low global self-efficacy (45% of students had mean scores greater than 3.25; only 16% had scores less than 2.5). Many participants also reported liking targeted tasks, even though they presumably found them difficult (as evidenced by their selection of the targeted task for intervention). Thirty-six percent of students gave mean preference ratings that were 3.25 or greater, although 32% of students' means were 2.5 or below. At the same time, it is clear that postsecondary students with learning disabilities are at risk for very low task-specific perceptions of self-efficacy. Thirty-three percent of students rated their confidence in their ability to meet task specific requirements as low (i.e., mean ratings of 2.5 or below). For 53% and 55% of students respectively, self-perceptions of task-specific competence and ability ratings were low. On the Self-Efficacy across Tasks measure, 62% of students had mean scores below 2.5 for tasks targeted for intervention, and 59% rated themselves as having significant difficulties across a range of academic tasks. Finally, few students rated their task-specific competence or ability in the same range as the normative sample of peers (i.e., only 8% and 7% of students' mean ratings fell above 3.25, respectively). These data suggest that postsecondary students with learning disabilities frequently hold motivational beliefs that are likely to interfere with effective self-regulation (Bandura, 1993; Paris & Byrnes, 1989; Schunk, 1994; Zimmerman, 1995). They appear to have little confidence in their abilities to succeed in academic domains.

<u>Attributions</u>. At pretest, students rated the importance of 6 factors (on a scale from 1 to 5) for successful and unsuccessful performance, respectively. These factors were ability, effort, strategy use, availability of help from others when needed (i.e., strategic help-seeking), dependence on the help of others, and luck. Across all studies, students' ratings were highly variable. This variability is reflected in the large standard deviations reported in Table 2. They are also apparent in Figures 4 and 5, which depict the distribution of students' attributional ratings for successful and unsuccessful performance. For the purposes of characterizing students' beliefs about causal influences related to academic performance, students' ratings were clustered to reflect students' perceptions of whether each factor was of low importance (ratings of 1 or 2), some importance (ratings of 3), or high importance (ratings of 4 or 5).

Insert Figures 4 & 5 about here

One clear trend in these data is that postsecondary students with learning disabilities are not likely to credit ability for successful performance (only 14% of students rated ability as an important causal factor when doing well). In contrast, 78% of students attributed at least some importance to low ability when they did not do well (with 47% of those giving ratings greater than or equal to 4). This pattern is consistent with previous research showing that students with learning disabilities possess unproductive attributional patterns (see Borkowksi, 1992; Bryan, 1998; Paris & Byrnes, 1989). Consistent with the self-efficacy data, these ability attributions underline students' lack of confidence in their ability in academic domains. They also suggest that changing students' perceptions of their low ability may require intensive intervention (i.e., to change attributional patterns that reinforce students' construction of low ability perceptions) (Borkowski, Weyhing, & Carr, 1988; Groteluschen & Hale, 1990; Paris & Brynes, 1989).

Most participants recognized the contributions of effort to doing well (64% credited effort for successful performance). In contrast, only 29% felt that low effort was an important causal factor when they did not succeed. This suggests that most students felt that exerting effort did help improve performance, but that effort alone was insufficient to ensure success. In other words, for most students, they did not consider their lack of success a result of failure to try. In contrast, students were evenly split about the importance of strategy use for successful performance (30%, 32%, and 39% of students rated strategies as having little importance, some importance, or a great deal of importance, respectively). At the same time, 56% attributed poor performance to a lack of effective task approach strategies. This pattern suggests that, when judging causes for unsuccessful performance, students often felt they were trying (so that low effort was not the problem), but recognized that they lacked effective strategic approaches (i.e., ideas for how to profitably direct effort). This pattern indicates that most students possessed important metacognitive knowledge about the importance of effortful strategy use to academic success. This finding is perhaps not surprising, however, given that these students had self-selected themselves for inclusion in a project focused on promoting strategy development.

Finally, adult students with learning disabilities appeared unlikely to attribute either successful or unsuccessful performance to luck. However, many students did feel that their success was dependent, at least to some extent, on the assistance of others (59% gave help from others at least a rating of 3). Students also recognized the importance of being able to strategically seek help when necessary (79% gave ratings of 3 or above).

Metacognitive Knowledge

Students' responses to the metacognitive questionnaire were scored on a scale from 0 to 3, where scores of 0 or 1 reflected no or clearly deficient metacognitive understandings, scores of 2 reflected some degree of metacognitive knowledge, and scores of 3 reflected articulated and complete metacognitive descriptions. Mean scores on each of six metacognitive dimensions are presented in Table 2. The distribution of students scores for the same dimensions are represented in Figure 6.

Insert Figure 6 about here

The responses of all 90 participants were scored on four dimensions: task definition, strategy description, strategy focus, and monitoring. Distributions of students' scores showed that a significant number of students had deficient metacognitive understandings in each of these areas (38%, 32%, 41%, and 18% of students received scores of 0 or 1 on the task definition, strategy description, strategy focus, and monitoring subscales, respectively). Less than 10% of students received ratings of 3 on any of these scales. Students' greatest difficulties were in the identifying task demands and describing how strategy use could be profitably focused, given specific task requirements. Thus, these data serve to clarify the inefficiencies in students' learning activities. Although students may well exert effort to learn, they appear to have a lack of confidence in their knowledge about strategies (from the attributional data), have difficulties articulating task requirements, and are unsure of how to focus strategic approaches so as to meet task demands. Note, however, that most students did bring some knowledge about strategies to early interventions (i.e., students could not be described as self-regulating "blank slates"; Butler & Winne, 1995). For example, sixty-eight percent of students could provide some reasonable descriptions of strategic approaches (scores of 2 or 3).

Only a subset of students mentioned their level of confidence and/or motivational or emotional challenges in their responses to the Metacognitive Questionnaire (see Table 2 and Figure 6). Students who mentioned their levels of confidence tended to express some confidence in their ability to complete tasks (57% received scores of 2), although only 17% were highly confident. Interpreting these ratings is difficult, however, because it is not possible to determine whether students who did not comment would have been systematically higher or lower in confidence. In contrast, those students who discussed emotional responses to tasks were clearly experiencing difficulties. Of the 28 students who discussed motivational or emotional challenges, 86% appeared to have poor metacognitive awareness of possible volition control strategies. In other words, these students were likely to express difficulties sustaining motivation or handling frustration, stress, or anxiety, but without corresponding descriptions of how they might handle those challenges.

Self-Regulated Processes

Table 3 presents an overview of results from the qualitative analyses of students' pretest approaches to tasks. Concurrent analyses of interview, questionnaire, and observational data suggested that postsecondary students with learning disabilities have difficulty across all of the cognitive activities central to self-regulation (see Figure 1). Of the five key components listed in Table 3 (task analysis, strategy use, monitoring, confidence, and emotions/volition control), every student had difficulty with at least one component, a few students had problems in all five areas, and the majority of students had problems in 2 to 4 areas (the mean number of areas in which students experienced difficulty was 2.92; SD = 1.07).

Insert Table 3 about here

Task Analysis. It was argued earlier that task analysis is a key process in self-regulated learning because students self-direct learning efforts based on their perceptions of task demands. It is therefore notable that 68 (76%) of the 90 students experienced difficulties with task analysis (see Table 3). In early sessions, 53 students (59%) described task demands in limited, vague, or inaccurate terms. For example, one student described the purpose of reading as "trying to learn to do well", another stated that, when learning math, one's goal is to "get an answer", and a third suggested that her job when writing was to "improve sentence structure and spelling". Consistent with prior research (see Butler, 1998-c; Campione, Brown, & O'Connell, 1988; Englert, 1990; Wong, 1991), these data suggest that a majority of students possessed inadequate or inaccurate metacognitive knowledge about tasks.

Further, twenty-four students (27%) either failed to attend to explicit assignment directions and/or had difficulty interpreting their meaning. (Given that not all students were given assignment descriptions, this high percentage is also notable). For example, one student was observed to write a paragraph based on the game 20 questions when her task was to write a narrative paragraph. Before writing, she failed to read the instruction booklet that explained what a narrative paragraph was. Another student wrote a chronological description of her observations at a daycare, although she had been asked to write a targeted response to a series of particular questions (based on her observations). She had read her two-page, detailed assignment sheet once before she went to the daycare, but then failed to return to the instructions again prior to completing her assignment.

<u>Monitoring</u>. Only 9 students (10%) described strategic approaches and/or approached tasks with little evidence of self-monitoring. However, students commonly had difficulty defining criteria for self-evaluation (43 students, or 48%). For example, 14 students (16%) stated that they relied on external criteria such as grades or the judgments of friends to let them know when they had done a good job (e.g., written a good essay, studied well for a test, solved a math problem correctly). Another 13 students (14%) expressed concern about their abilities to judge how well they were doing. For example, when asked how she knew whether she was studying effectively, one student responded, "I'm never really sure". Finally, 16 students (18%) were able to describe criteria for judging the quality of their performance, but the criteria described were limited or deficient. For example, one student described how he priorized what he should remember during reading. He indicated that, as he reads, he thinks: "I'm enjoying this. I should remember this material". When asked how he knew if he had done a good job when reading, another student gave a vague, non-specific response: "It's a satisfactory feeling and I've convinced myself 'job well done'".

Clearly, task analysis and monitoring are interdependent activities and students' ability to set criteria for monitoring is dependent on adequate knowledge about tasks. Thus, not surprisingly, in this study 38 students (42%) had deficiencies in task analysis *and* problems with monitoring. Further, an important finding was that 73 out of the 90 students (81%) experienced difficulties in one or both of these areas. Thus, these data suggest that a major problem for postsecondary students with learning disabilities is in efficiently orchestrating their learning activities based on a clear understanding of productive learning goals. How can students self-regulate their learning activities efficiently if they misperceive task requirements and/or are not certain of criteria for generating judgments about progress (and therefore for adjusting learning efforts adaptively)?

<u>Strategy Use</u>. Overall, 68 students (76%) had difficulty describing and/or implementing focused and effective strategies for completing targeted tasks. Sixty-four students identified strategies that were vague, limited, or ineffective (during interviews or when working on tasks in early intervention sessions). Examples of these students' strategy descriptions included: "I read it over once and hope to retain it" (to study); "[I] just reread and reread and reread" (to learn computer skills); "[my strategies are] reading the text and consulting class notes" (to study); "I don't have any method. If I don't understand something I'll keep going over it till I do" (for learning math); "[I] read, use rules, find a reasonable answer, cheat" (for learning math); "I just read and ... hope I get it" (for reading); "what I do... is just go ahead and start reading and hopefully it will make some sense ... often it doesn't" (for reading); and "I write my thoughts as they flow through my mind, in sentences. (for writing)" When asked what goes on in her head when writing, one student responded: "I'd love to know...everything in my head for the essay. I write down my point and at the end I have a mess." When asked how he approached math problem solving, another student replied "Very carefully. If I am using them [strategies], I'm not aware of it".

Out of these 64 students, 35 could describe problem areas and/or what they wanted to achieve and recognized that their strategies were not effective (consistent with the attributional data). For example, one student said directly, “I don’t use the right method”. Sometimes these students suggested ideas for what they might try, but their solutions were hypothetical, not worked out, or non-specific. For example, one student said she needed to have “more focus, to find main ideas and follow through and develop a method of visualizing”. Another understood that she should identify main ideas and themes from her readings, along with how the author used literary devices to convey them. However, she was unsure how “to sort out main themes from details” or to take her ideas and “answer questions without going off on tangents”. Another student stated that “[I need to] read with more of an active intent to understand and remember the most important elements of the material, whatever that may be”. Other students described what they *should* do, and then admitted that was not what they did. For example, one student said “[I should] draw pictures or do a spider web to organize my thoughts and ideas”.

Finally, 7 students (8%) articulated potentially effective strategies, but did not implement them effectively. For example, one student was observed to preview chapter headings, read a chapter’s introduction and summary, highlight vocabulary, look up unfamiliar words in a dictionary, refer to related texts on the same topic, and take notes on what she was reading, without ever focusing her attention on a chapter long enough to pull out any main ideas.

For many students, problems in strategy use could be linked to inadequate understandings about tasks. For example, when students (commonly) described learning math as memorizing formulas and matching them to different types of problems (rather than grasping concepts and representing problems in terms of those conceptual understandings), they were frustrated by the ineffectiveness of their strategies (and at instructors for changing how problems were worded). For example, one student stated that she does poorly on math problems when “the math problems are stated wrong” or “were taught differently”. Similarly, another student complained: “Either I recognize the type of solution needed and work through with information given and previous learned knowledge... If I can’t solve it, I just blank out.”

Motivational Beliefs. In early discussions with students, 30 students (33%) expressed motivational beliefs (especially attributions and perceptions of self-efficacy) that seemed to undermine their self-regulated learning. Twenty students either indicated that their confidence was low or described their task performance as very poor. Nine of these students also explicitly linked task performance problems to a lack of confidence. For example, one student explained how her lack of confidence in her writing abilities led her to seek help from others for editing; another student described how she often works on projects alone because she thinks she is “dumb” and others would not want to work with her; a third student, who had taken several psychology courses, said that he had developed “learned helplessness” and so avoided reading tasks. An additional 7 students attributed performance problems to low ability. For example, one student’s explanation for his poor performance was: “I’m naturally bad with languages”. Overall, 12 students described attributions for poor performance that could undermine successful performance (including the 7 students who made attributions to low ability).

Emotions and Volition Control. In early sessions, 44 students (49%) described experiencing unpleasant emotional reactions while working through tasks, particularly frustration (28 students) or worry, stress, anxiety, or panic (16 students). Of these students, 23 students described emotional reactions (particularly frustration) as arising from difficulties they experienced when completing tasks. In contrast, 21 students described ways in which negative emotions (particularly worry, stress, anxiety, or panic) interfered with their ability to complete tasks. For example, one student described how he worries too much and that sometimes" stress gets overbearing". As a result, he finds it hard to "get motivated" and he "gets easily discouraged". Another student described how, when he is taking tests, he "gets nervous", loses concentration, feels stupid, does not want to finish, works slower, and becomes distracted. As in the case of this latter student, many students reported having difficulties maintaining concentration or focus while working on tasks (n = 21 or 23%). Thirteen of these students (14%) explicitly linked difficulties with focus to their emotional responses to tasks. Twelve students (13%) reported difficulties with procrastination (8 of whom also reported problems staying focused while working).

Case Study Examples

These qualitative analyses clearly suggest that postsecondary students with learning disabilities experience a range of difficulties that interfere with their successful completion of tasks. Further, it should be noted that these various difficulties were not independent. Problems in task analysis were linked with difficulties with monitoring. Students' lack of confidence and emotional reactions arose from a lack of academic success and in turn served to undermine further achievement. To illustrate the interconnectedness among these aspects of self-regulated processing, an integrated description of two students' difficulties is provided below.

Linda[1]. Linda was a student learning statistics who participated in the first SCL study (see Butler, 1993, 1995). Observation of Linda's approach to learning (coupled with responses to questionnaires and interviews) showed, first, that Linda had flaws in her metacognitive knowledge about tasks. She was one of several students who thought that learning math involved memorizing formulas and them matching them to specific problems. Consistent with her perception of the task, Linda's strategy for problem solving was to try to match formulas to particular problems. As she said, "I look at it and try different methods, but if I can't do it straight off, if I don't recognize it... then I find it quite hard." In turn, Linda described the anxiety she frequently felt when trying to solve math problems that interfered with her ability to complete the task: "If I find it difficult or [there's] not enough information I blank out -- panic probably". Thus, for Linda, her misunderstanding of math tasks influenced the strategies she employed. Then, when her strategies were ineffective, her difficulties led to anxiety and panic, which further undermined her success.

Jeanine. Jeanine was a 4th year biology student in the most recent SCL study (see Butler et al., 1999). Observations of Jeanine's approaches to learning (coupled with questionnaires and interviews) showed, first, that Jeanine experienced difficulties with task analysis. For example, Jeanine described how she had written an essay before reading the assignment description resulting in a final paper that was "off track". Similarly, Jeanine identified her problem with writing assignments as in: "organizing thoughts to write the paper, to actually answer the question -- even what is the question?" Jeanine's ability to articulate task demands also was somewhat limited. When asked "what is reading about" she replied, "conveying information to the student". She said that she could judge when she had done a good job while reading "At the end of the course when I get my grade" (suggesting a lack of criteria for self-monitoring). Consistent with her self-report, observations of Jeanine's initial approaches to reading confirmed that she had trouble targeting what was important (e.g., what she should pull out of an original research article). When accounting for why she had difficulties compared to more successful students, Jeanine simply suggested that "successful students think differently". At the same time, Jeanine evidenced many strengths. She had excellent listening comprehension and critical thinking skills. She also was very organized. She said that she avoided stress by starting assignments well in advance and working diligently on them (also confirmed through observation).

Remediating Students' Processing Difficulties: The SCL Approach

Given the range of difficulties experienced by adult students with learning disabilities, promoting more "efficient" approaches to tasks clearly requires supporting students to (1) engage effectively in the complete cycle of cognitive activities central to self-regulation, including task analysis, strategy selection and implementation, and monitoring (see Figure 1); (2) construct metacognitive knowledge and motivational beliefs supportive of self-regulation, and (3) develop volition control strategies to manage potentially intrusive emotions and/or distractions (Butler & Winne, 1995; Corno, 1994; Groteluschen, Borkowski, & Hale, 1990; Harris & Graham, 1996; Pressley & Associates, 1992; Schunk, 1996; Zimmerman, 1995)

The SCL instruction model was designed to achieve these objectives (Butler, 1993, 1995, 1998). To promote students' flexible self-regulation of learning activities, in SCL students are provided with calibrated assistance to engage in each of the cognitive processes central to self-regulation in the context of meaningful work (Palincsar & Klenk, 1992). This support is provided within interactive discussions focused alternately on task completion (e.g., actually generating ideas while writing) and on the process of completing the task (e.g., whether a particular strategy is working) (see Butler, 1998-e; Kamann & Butler, 1996). To support students' construction of metacognitive knowledge, students are continually asked to articulate emerging understandings about learning (i.e., about tasks, strategies, monitoring, their learning strengths and preferences as well as the challenges they face as learners, the link between strategy use and outcomes) (Butler, 1998-b; Paris & Byrnes, 1989; Wong, 1994). Students' development of positive motivational beliefs is supported by building from what students already do well, so as to emphasize competencies (not just problems), and by directing students' attention to the connection between effortful strategy use and improvements in task performance, thereby bolstering confidence and students' attributions for success to the effortful use of strategies (Reid & Borkowski, 1987; Schunk, 1994; Schunk & Cox, 1986). Finally, when students are confident, possess an enhanced repertoire of cognitive, metacognitive, and volition control strategies, and are actually more successful, they are also less likely to experience levels of frustration, stress, or anxiety that interfere with their completion of tasks.

SCL in Post Secondary Settings: An Overview

Recall that, to date, SCL instruction has been provided as an adjunct to regular classroom instruction in postsecondary settings. In the individualized tutoring and peer tutor studies, students chose tasks to work on and then brought assignments to sessions, and instruction was provided in the context of that meaningful work. In the group-based study skills class, instructors met with small groups of students (3 to 5 students per group), all of whom worked on a common task (e.g., reading and studying). Still, at any given session, a task drawn from one students' actual work was selected to form the basis for instruction. In each of these SCL applications, instructors guided students to self-regulate performance adaptively, flexibly, and reflectively.

Instructors began by supporting students to analyze task requirements, articulate performance criteria, and set specific goals. At this (and every other) stage of instruction, support targeted individuals' needs. For example, if a student held misconceptions about a task, the instructor supported the student to scrutinize task descriptions or assignment exemplars to abstract more accurate conceptions. Next, instructors supported students to select, adapt, or even invent strategies in light of task goals. A central characteristic of the SCL model is that, instead of teaching pre-identified strategies as the starting point for instruction, instructors assist students to problem-solve strategies building from strategies they already know and a clear understanding of task requirements. Thus, in these studies, students were initially supported to evaluate known strategies in light of what they were trying to achieve. This often entailed asking students to implement their current strategies, monitor outcomes associated with strategy use, and maintain, revise, or replace strategies based on discrepancies between progress and goals. In cases where students' current strategies were clearly inadequate, students and instructors brainstormed alternatives and evaluated options (given task demands). Both students and instructors contributed suggestions to this discussion, but students ultimately were asked to take responsibility for making decisions about which strategies to use.

Finally, instructors observed students' strategic performance and supported their cognitive processing "on-line". When obstacles were encountered or at natural breaks in the task, students were encouraged to reflect on their performance, to self-evaluate progress, and to make judgments about how to proceed. As in strategy selection, task criteria set the standards against which progress towards learning goals was judged. Thus, within each intervention session, students were assisted to diagnose problems (cognitive, motivational, or volitional), to build on what they already did well, and to revise strategies that were not working. Over time, students were assisted to build personalized strategies based on their unique processing strengths and weaknesses and in response to their particular difficulties with tasks. Through this process, students were assisted to build not only better task-specific strategies, but also metacognitive and volitional strategies for managing learning activities.

A Summary of Outcomes

This section provides a summary of outcomes for the 62 students who participated in SCL interventions[2]. In general, SCL intervention has been associated with improvements in students' task performance, metacognitive knowledge about tasks, strategies, and self-monitoring, perceptions of self-efficacy, and patterns of attributions. Students have developed personalized strategies that address their individual needs. Students also have been observed to take an active role in strategy development and to transfer strategic performance across contexts and across tasks (see Butler, 1993, 1995, 1998-d; Butler et al., 1999).

A summary of findings related to changes in metacognitive knowledge and motivational beliefs is presented in Table 2. The table presents pretest data across all 90 participants, pooled posttest means across studies ($\underline{N}$ = 62), and a set of columns that summarize statistically reliable gains across studies (indicated with a "*"). The first 3 of these latter columns summarize outcomes from 4 studies where SCL was used as a model for individualized tutoring by learning specialists, counsellors, or teachers (see Butler, 1992, 1993, 1995, 1998-d). The fourth depicts pooled results from 2 studies wherein peer tutors were trained to use SCL (see Butler et al., 1997). The final column presents the results from a study where SCL was used in a group-based study skills course (see Butler et al., 1999). (Note that reported results summarize analyses completed within the separate studies and are not based on comparisons to control group data or to the pooled posttest results reported here).

The results reported in Table 2, coupled with additional findings summarized above (e.g., improvements in task performance and self-regulated processing) suggest, first, that SCL instruction can be associated with significant gains across several types of outcomes. This is particularly notable given that these gains were achieved in a relatively short period of time by students with long-standing difficulties. Second, not surprisingly, the most consistent and powerful gains were achieved by students who received individualized tutoring from learning specialists, counsellors, or teachers (see columns 1 to 3), although students in the group-based study skills courses also appeared to make substantial improvements (see column 5). Finally, results from the two peer tutor studies were more limited (and serve to depress the pooled posttest means presented in Table 2). Close scrutiny of the data from the peer tutoring projects showed that, when tutors faithfully implemented the SCL approach, tutees did make clear gains (see Butler et al., 1997). However, general effects appeared to be diluted in those two studies due to logistical and administrative barriers (e.g., hiring peer tutors half-way through the semester; difficulties coordinating training for tutors). Additional research is planned to assess SCL efficacy as a model for peer tutor training when those barriers are removed.

Conclusions and Implications

The data presented in this paper underline the importance of supporting the development of self-regulated learning by students with learning disabilities. Clearly students' lack of success in educational contexts derives not just from problems with basic academic skills such as decoding, spelling, or computation (though students often experience persistent problems in these areas; Adelman, O'Connell, Konrad, & Vogel, 1993; Adelman & Vogel, 1990; Vogel & Moran, 1982). Students' task performance also is clearly undermined by inadequate metacognitive knowledge, unproductive motivational beliefs, and inefficient approaches to tasks.

The findings presented in this paper also illuminate how and why students' approaches to tasks are inefficient. An important finding is that the vast majority of students experience difficulties in deciphering tasks and/or establishing criteria for monitoring. Yet, effective self-regulation requires adaptively and flexibly selecting strategies that match task demands and then monitoring outcomes and adjusting strategies based on observed progress towards goals (Swanson, 1990). Students who misperceive task demands and lack productive criteria for judging performance are not in a position to self-direct learning effectively (Butler & Winne, 1995), regardless of how much effort is expended in implementing strategies for learning. Thus, assisting students to self-regulate effectively requires supporting them to construct metacognitive knowledge about tasks and, relatedly, criteria for judging progress. At the same time, students also need to learn the importance of analyzing tasks as a cognitive activity and to develop strategies for interpreting assignments.

Results reported in this paper also suggest that students need to develop better strategic approaches, both for completing tasks and for managing learning activities. Students need to learn how to focus strategic efforts flexibly based on fluctuating task demands, across a wide variety of tasks (Swanson, 1990). Results also underline the interconnectedness between cognition, motivation, and volition. Supporting self-regulation requires attending to students' development of positive motivational beliefs, helping prevent potentially debilitating emotions that can be associated with low-confidence and a lack of success, and supporting students to develop volition control strategies to manage motivation and emotions (Corno, 1993, 1994).

Finally, results also suggest that SCL instruction has the potential to remediate students' ineffective approaches to tasks. These findings are important in two respects. Practically speaking, they suggest that SCL might be profitably used by practitioners to support the success of students with learning disabilities, at least in postsecondary settings. More generally, findings that students' success can be enhanced by an intervention designed to promote self-regulation provides evidence for a causal connection between students' pretest learning inefficiencies and performance deficits. Coupled with the descriptive data documenting the types of problems students experience, outcome data reinforce the importance of assessing and remediating deficiencies in students' self-regulated approaches to tasks.

Notes

1 All names are fictional.

2 Note again that this number of participants underestimates the number of students involved in each study, because some students participated in more than one study (so that this total N does not match the total N across studies reported in the footnotes to Table 2).

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Table 1. Overview of Participants across Seven Studies (1993 to 1999).

Study	n[1]	Age	Gender		Number of intervention sessions	Total time spent (hours)
		Median (min-max)	Male	Female	Median (min-max)	Median (min-max)
SCL 1993	8	24.00 (18-36)	3	5	11.50 (7 - 15)	17.75 (11 - 28.50)
SCL 1994	13	32.00 (21 - 45)	3	10	15.00 (8 - 19)	17.00 (8.50 - 26.00)
INNOVATIONS YEARS 1 & 2	14	35.50 (19 - 48)	5	9	20.00 (9 - 39)	23.00 (11.50 - 43.50)
PEER TUTOR PROJECTS (2)	14	24.50 (19 - 49)	8	6	8.00 (2 - 24)	10.25 (2.50 - 24.50)
GROUP STUDY	13	33.00 (19 - 55)	6	7	17.00 (12 - 19)	24.00 (15.75 - 28.50)
CONTROL STUDENTS	28	28.50 (19 - 50)	15	13	n/a	n/a
TOTAL[2]	90	29.00 (8 - 55)	40	50	14.00 (2 - 39)	17.25 (2.50 - 43.50)

1 A number of students participated in two consecutive studies. These totals count those students only once (and so underestimate the number of students per study). Data from these students included their age at the beginning of the first study and the average number of sessions and time spent across the two studies;

2 Summary data on intervention sessions were calculated across students who participated in interventions only (N = 62).

Table 2. Scores from Questionnaires and Interviews at Pretest & Posttest

Measure	Pretest Score			Posttest Score			Pre-post comparisons by study[4, 5, 6]				
	n[1]	M	SD	n[1]	M	SD	1	2	3	4	5
Metacognitive Knowledge[2]											
Task description	90	1.67	(.64)	61	2.01	(.76)	n/a	*		-	*
Strategy description	90	1.68	(.79)	61	2.19	(.83)	n/a	*		-	*
Strategy focus	90	1.54	(.78)	61	2.13	(.84)	n/a	*		-	-
Monitoring	90	1.84	(.62)	61	2.20	(.56)	n/a	*		*	-
Overall (average)	90	1.68	(.71)	61	2.13	(.75)	*	*	*	-	*
Confidence	30	1.90	(.66)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Action Control	28	1.14	(.36)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Self-Efficacy[3]											
Global self-efficacy	64	3.37	(.73)	46	3.36	(.66)	n/a	-	-	-	-
Task specific confidence	64	2.78	(.67)	46	3.00	(.78)	n/a	*	*	-	*
Perceived competence	85	2.48	(.64)	65	3.00	(.72)	*	*	*	*	*
Task Preference	22	3.02	(.91)	37	3.15	(.70)	*	-	n/a	n/a	n/a
Ability Rating	86	2.42	(.82)	49	2.89	(.84)	*	*	-	-	*
On targeted task	79	2.40	(.90)	60	2.83	(.81)	n/a	*	*	*	*
On other academic tasks	80	2.33	(.67)	60	2.94	(.77)	n/a	-	*	*	*
Attributions[3]											
Successful Performance											
Ability	86	2.51	(1.20)	67	2.88	(1.04)	*		*		
Effort	86	3.18	(1.20)	67	4.22	(.78)	*				
Strategy use	85	3.12	(1.20)	67	3.67	(.95)	*		*		*
Help available	86	3.34	(1.20)	66	2.71	(1.15)					
Luck	86	1.77	(1.10)	67	2.12	(.88)					
Depended on others	63	2.72	(1.30)	48	3.18	(1.25)			*		*
Unsuccessful Performance											
Ability	86	3.42	(1.30)	67	3.04	(1.24)	*	*			
Effort	86	2.62	(1.30)	67	2.61	(1.43)					
Strategy use	86	3.72	(1.30)	67	3.30	(1.25)					
Help available	86	2.97	(1.40)	66	2.53	(1.17)					
Luck	86	1.48	(.90)	67	1.79	(.76)					
Depended on others	62	2.61	(1.20)	48	2.73	(1.51)	*				

Notes:

1 scales included in questionnaires differed across studies, so that the n varies across scales;

2 on a scale from 1 to 3;

3 on a scale from 1 to 5;

4 "*" results that were statistically reliable, "-" results that were not statistically reliable, "n/a" scale not used;

5 (1) Study 1 (n = 8), see Butler (1992; 1993, 1995); (2) Study 2 (n = 13), see Butler (1998); (3) Studies 3 & 4 pooled (n = 21), see Butler (1998); (4) Studies 5 & 6 pooled (n = 14 to 25, depending on criteria for inclusion), see Butler et al. (1997); (5) Study 7 (n = 18), see Butler et al. (1999);

6 To assess changes in metacognitive dimensions, scores from Studies 2, 3, & 4 were pooled.

Table 3. Qualitative Analysis of Students' Problems with Self-Regulated Processing.

Component of Self-Regulation	n out of 90	(%)[1]	Students' Areas of Difficulty	n [1]
Task Analysis	68	(76%)	• Describing task demands in limited, vague, or inaccurate terms	53 (59%)
			• Failing to attend to assignment descriptions or difficulty interpreting assignments or problems	24 (27%)
Monitoring	44	(49%)	• Problems in defining criteria for monitoring performance: articulating no or limited criteria (n = 16), relying on externally provided criteria (n = 14), or expressing uncertainty in terms of how to judge performance (n = 13)	43 (48%)
			• Little or no evidence of engaging in monitoring	9 (10%)
Strategy Use	68	(76%)	• Describing limited, vague, or ineffective strategies for completing tasks	64 (71%)
			• Describing areas needing improvement, but having little idea of what to do about it	35 (39%)
			• Problems implementing strategies that might be effective, if students knew how to use them	7 (8%)
Motivational Beliefs	30	(33%)	• Evidence of low confidence, negative self-evaluations, or attributions to low ability	26 (29%)
			• Other unproductive attributional patterns (e.g., external attributions)	5 (6%)
Emotions and/or Volition Control	52	(58%)	• Expressing negative emotions (frustration, anxiety, worry) that arise because of difficulties with the task	23 (26%)
			• Expressing negative emotions (frustration, anxiety, worry, panic) that interfere with task performance	
			• Problems with task avoidance or procrastination	21 (23%)
			• Problems maintaining focus or concentration	12 (13%)
				21 (23%)

[1] Note that many students experienced more than one problem, both within and across these areas. The n's reported in this table identify all students who experienced the targeted problem, without accounting for overlaps (i.e., the same student could be counted more than once).

Figure 1. A simplified model of self-regulated learning.

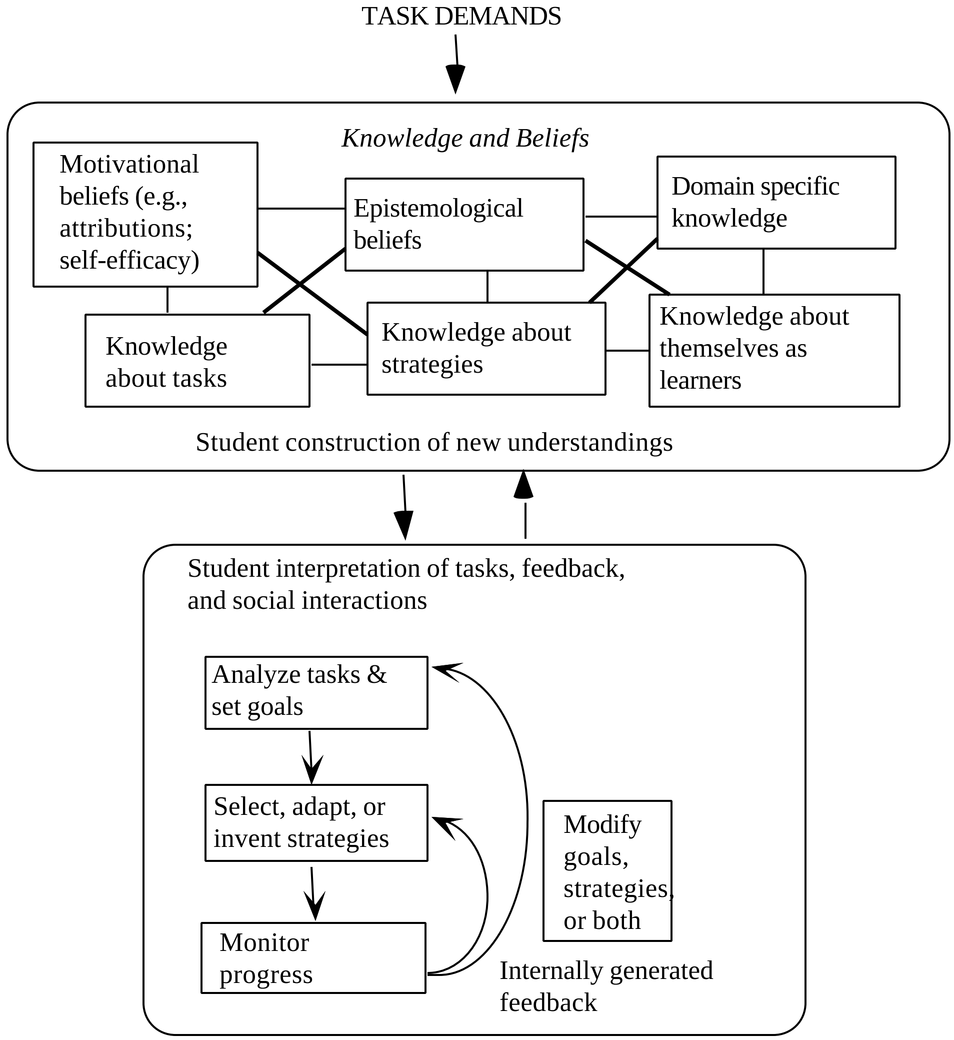

Figure 2. Study Design: Multiple Parallel Case Studies Across Studies

Each Case Study:

Pretest	Intervention Period	Posttest
Questionnaires Interview Observations	Task Performance Records Strategy Records Field Notes & Audio Tapes	Questionnaires Interviews Observations

OUTCOMES
• Task Performance • Metacognition • Self-Efficacy • Attributions • Strategy Development • Transfer of Strategy Use