Promoting Self-Regulation in the Context of Academic Tasks:

The Strategic Content Learning Approach

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Running Head: Promoting SRL in Academic Tasks: The SCL Approach

Paper presented at the 1998 (August) meeting of American Psychological Association in San Francisco, California. This research was supported in part by a Social Sciences and Humanities Research Council of Canada Research Grant awarded to the author. I would like to acknowledge the following members of my research team for their invaluable assistance on the projects described herein: Michael Kamann, Shannon Poole, Cory Elaschuk, Sandra Jarvis, and Lisa Robinson. Correspondence concerning this article should be addressed to Deborah L. Butler, Department of Educational Psychology and Special Education, Faculty of Education, University of British Columbia, Vancouver, B.C. V6T 1Z4, Canada. (Phone: (604) 822-0575; Fax: (604) 822-3301; e-mail: dbutler@unixg.ubc.ca).

This paper examines the nature of instruction that can be linked with students' development of self-regulated approaches to academic tasks. The paper begins by offering a model of self-regulation in academic domains. This is followed by a brief description of instructional principles that have been associated with students' development of self-regulation and of one intervention model based on those principles, the Strategic Content Learning (SCL) approach (Butler, 1992; 1993; 1995; 1998b; in press). Then, the bulk of the paper reports findings from SCL research. Within these discussions, the paper addresses two key questions. These are: (1) What is the nature of mature self-regulated performance in the context of academic work? (or, What are we trying to promote?); and (2) How can instructors interact with students so as to promote self-regulated performance?

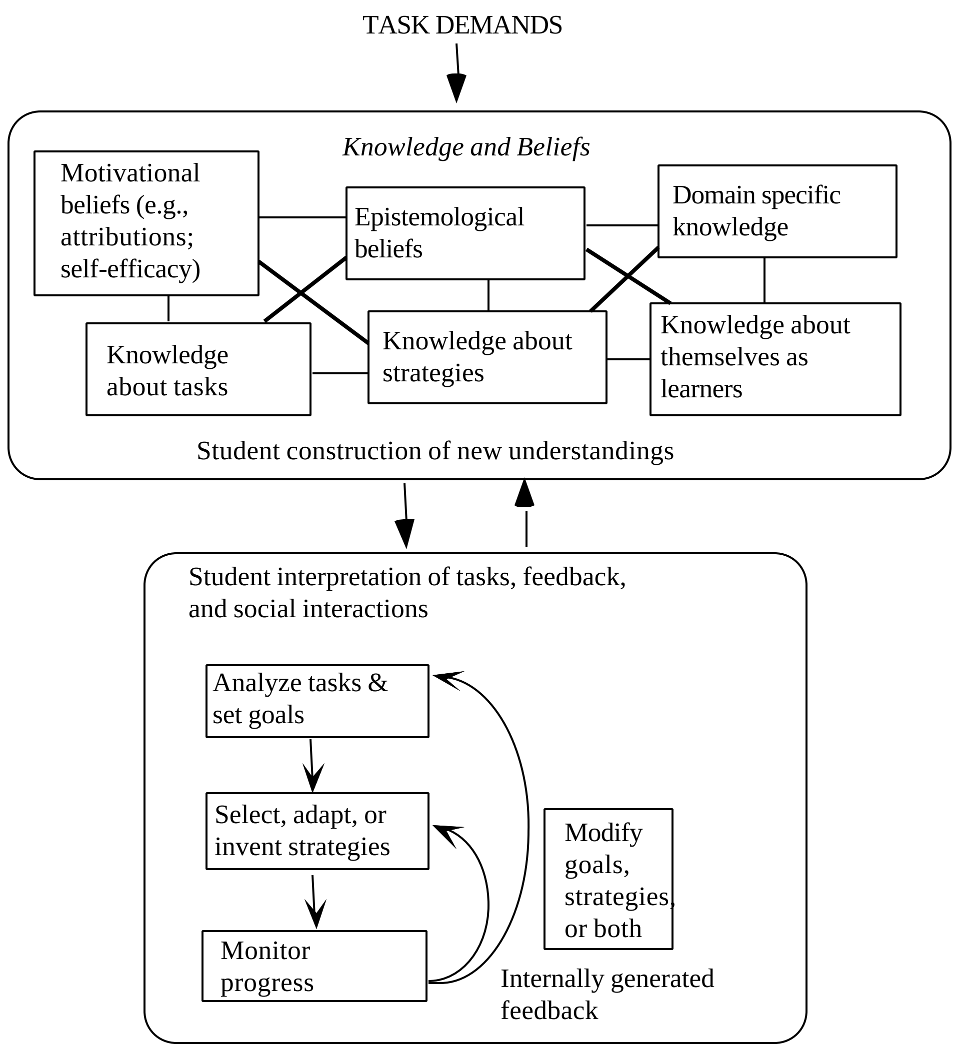
Self-Regulation of Academic Performance

Several models have been offered to characterize self-regulated performance in the context of academic domains (see Butler & Winne, 1995; Corno, 1993; Zimmerman, 1989; 1994). Drawing on these various descriptions, a simplified model of self-regulated learning is depicted in Figure 1. In general, self-regulated learning can be described as students' flexible, planful, and recursive engagement in a sequence of cognitive activities. Self-regulated learners start by analyzing task requirements, defining performance criteria, and setting learning goals (Butler & Winne, 1995; Dweck, 1986). This step is critical because learners make decisions about how to self-direct learning based on perceived task demands. Next, self-regulated learners identify strategic approaches likely to accomplish their objectives. This entails selecting, adapting, or even inventing strategies to match task demands. Finally, self-regulated learners implement strategies, monitor outcomes associated with strategy use, make judgments about task performance and strategy efficacy, and adjust learning approaches based on the success of their efforts. In this respect, monitoring is "a pivot around which recursive cycles of self-regulated processing turn" (Butler, 1998b, p. 164; see also Butler & Winne, 1995). Students modify and refocus their learning activities based on their perceptions of progress. At the same time, self-regulated performance is shaped by a variety of knowledge and beliefs (see Figure 1). For example, successful task analysis depends on productive understandings about tasks; and students draw on knowledge about strategies when selecting approaches to learning (Butler & Winne, 1995).

In discussions on "metacognition", researchers have suggested that different qualities of mature self-regulated performance may develop at different rates. For example, models of metacognition typically characterize strategic learning as encompassing the kind of planful, goal-oriented, problem-solving that is captured in models of self-regulation. Consistent with this suggestion, Brown (1980) defined metacognitive, or self-regulated, processing as students' "coordination and control of deliberate attempts to learn or solve problems" (p. 78). Brown (1987) also suggested that this kind of active, goal-oriented problem solving characterizes the performance of even young children, appears independent of age, and occurs prior to students' developing ability to talk abstractly about their performance. This suggests that even young children are not self-regulating "blank slates" (Butler & Winne, 1995) but rather bring problem solving abilities to school. Thus, promoting self-regulation may require, in part, helping students learn how to shape extant problem solving abilities to meet the demands of academic work.

Although even young children self-direct learning activities, children's ability to articulate understandings about cognitive processes (i.e., metacognitive knowledge) appears to be later-developing (Brown, 1987; Reeve & Brown, 1985). Researchers have suggested that metacognitive knowledge, or "one's knowledge concerning one's own cognitive processes and products or anything related to them" (Flavell, 1976, p. 232), emerges in tandem with developmental changes that permit students to see themselves as active cognitive agents, to think about cognitive means and goals, to reflect on their cognitive processes, and to participate in tasks that invite self-regulation (Flavell, 1987). Over time, and based on experiences with tasks, students begin to construct abstracted understandings about academic work (that do not always match what teachers intend; Campione, Brown, & Connell, 1988; Paris & Byrnes, 1989; Schoenfeld, 1988; Winne & Marx, 1982). As a result, promoting self-regulation also requires assisting students to construct productive metacognitive knowledge. Students also must be supported to construct positive motivational beliefs that support strategic processing (Zimmerman, 1995).

Figure 1. A Model of Self-Regulated Learning.



From Butler, D. L. (1998b).

Finally, mature self-regulated performance has typically been associated with students' reflective awareness about knowledge in tandem with conscious deliberation during learning. For example, Campione et al. (1988) suggest that strategic learning requires students' "ability to reflect upon both their knowledge and management processes" (p. 94). And, although researchers generally agree that many self-regulating processes are engaged rapidly, automatically, and outside of conscious awareness (e.g., Corno, 1986), the hallmark of strategic performance is the ability to consciously direct learning in the face of new tasks or problems (Butler, 1998a). For example, although proficient readers may not be aware of self-monitoring activities, they can shift from fluent cognitive processing (reading for meaning) to consciously orchestrated monitoring and debugging activities when comprehension problems occur (Brown, 1980; Butler, 1998a). Students' abilities to abstractly reflect on and orchestrate learning also are later developing (Brown, 1987). Thus, supporting mature self-regulated performance also requires assisting students to consciously reflect on and deliberatively coordinate their approaches to tasks.

In sum, promoting self-regulation requires supporting students to problem solve effectively when completing academic tasks, to construct metacognitive knowledge and positive motivational beliefs based on learning experiences, and to shift strategically between fluent cognitive performance and reflective self-regulation. In addition, although it is possible to describe self-regulated processing in generalized terms (as has been done so far in this paper), the way in which learning approaches are implemented must be responsive to task demands within content-area domains. For example, students often need both strategic and domain-specific knowledge to implement strategies effectively (Alexander & Judy, 1988). As a result, promoting self-regulation requires finding ways to help students construct generalized, metacognitive knowledge about (and approaches to) learning that may apply across domains while at the same time assisting them to particularize strategic performance in the context of domain-specific tasks.

Promoting Self-Regulation of Academic Performance

A number of instructional models designed to promote strategic learning have been described in the last decade (e.g., Butler, 1995; 1998b; Ellis, 1993; Englert, 1992; Harris & Graham, 1996; Palincsar & Brown, 1988; Pressley, Brown, El-Dinary, & Afflerbach, 1995). Research on the efficacy of these various models has uncovered instructional characteristics associated with students' development of self-regulation. Effective instructional models generally (1) are long-term, (2) promote strategy use in the context of meaningful academic work, (3) engage students in interactive discussions about learning processes, (4) are structured and explicit, (5) provide on-line, calibrated assistance, (6) require students to apply and adapt strategies across multiple task exemplars, and (7) assist students to recognize the applicability of strategic approaches across tasks and domains. This combination of instructional characteristics has been associated with improved task performance, development of metacognitive knowledge about learning processes, construction of positive motivational beliefs, and independent strategy transfer (e.g., see Butler, 1995; in press; Graham & Harris, 1989; Palincsar & Brown, 1984; 1988; Pressley et al., 1992).

Although most emerging instructional models share these core characteristics, two variants can be identified. Return for a moment to the earlier description of mature self-regulation and of what instruction seeks to promote (i.e., problem-solving; metacognitive knowledge and beliefs; reflective self-regulation; and generalized understandings that can be situated in particular tasks). Proponents of both variants agree that construction of metacognitive knowledge and positive motivational beliefs can be supported by engaging students in interactive discussions about learning wherein they explicitly define strategic approaches, learn how to implement strategies successfully, monitor their improved performance, and then recognize their ability to control task outcomes through the application of effort and strategies (Borkowski, 1992; Borkowski, Weyhing, & Carr, 1988; Butler, 1995; in press; Schunk, 1994; Schunk & Cox, 1986). Also, both variants promote students' back and forth movement between task completion (e.g., reading for meaning) and reflection on learning (e.g., evaluating the success of reading strategies) by providing instruction about strategies in the context of meaningful work and by supporting strategic performance on-line within interactive discussions.

In contrast, proponents of the two variants differ in their points of departure when promoting students' effective problem solving and links between generalized understandings about learning and contextualized strategic performance. In many models (e.g., Palincsar & Brown, 1984; 1988), the hypothesis is that students learn better problem solving performance by "internalizing" the cognitive activities initially modeled and then supported by others (so that they move from other- to self-regulation). Consistent with this idea, students often are asked to translate abstracted and generalized descriptions about task-specific strategies (explained and/or modeled by others) into situated cognitive actions. Instruction often begins with explicit description of strategy steps, modeling of strategy use, and an emphasis on students' mastery of the instructed strategies. Then, over time, students are encouraged to personalize and adapt strategies to meet task demands. Throughout instruction, mastery of strategies is promoted by engaging students in collaborative academic work (e.g., reading text as a group) during which they jointly apply, adapt, and discuss strategies given the demands of particular tasks.

The second instructional variant is exemplified by the Strategic Content Learning (SCL) approach (Butler, 1995; 1998b; in press). In SCL, mature academic problem solving is promoted, not by assisting students to internalize modeled processes, but by helping them to channel extant problem solving abilities effectively in the context of academic tasks. Further, rather than asking students to translate generalized descriptions about cognitive processing into cognitive actions, students are engaged in problem solving activities and then asked to articulate generalized descriptions, in their own words, linked to contextualized experiences (see Butler, 1995). In SCL, instructors use the activities of task analysis and monitoring as a frame for providing instruction. Instructors start by assisting students to analyze the demands of academic tasks so that they have a sense of what they are trying to achieve. Then, students are assisted to identify, try out, and evaluate potential learning activities given task demands. Within interactive discussions, instructors guide students to consider options or ideas without telling them what to do. Rather, their task is to assist students to monitor the success of alternatives and to make strategic decisions for themselves. Thus, in the SCL instructional variant, instructors promote mature self-regulation by working collaboratively with students, by focusing attention on task goals, and by assisting students to monitor the success of learning activities in light of task demands. Students generate abstracted descriptions about effective strategies based on their judgments about which strategies work.

Research on SCL Efficacy

To date, SCL has been implemented as a model for providing support to postsecondary students with LD's. Students with learning disabilities (LD's) have been described as "actively inefficient" in their approaches to tasks (Swanson, 1990). Further, students' with LD's learning inefficiencies have been linked to faulty problem solving (e.g, failing to analyze task demands; problems in matching strategies to task demands), inaccurate metacognitive knowledge (e.g., about the demands of typical tasks), and/or negative motivational beliefs (e.g., low self-perceptions of competence) (e.g., see Baker & Brown, 1984; Butler, 1998a; Englert, 1990; Jacobs & Paris, 1987; Wong, 1985; 1991). Thus, applying SCL in support of students with LD's provided an important context for research.

Within postsecondary settings, three service delivery models are commonly used to support students with LD's: individualized tutoring by counselors and/or teachers; peer tutoring; and study skills classes. The data reported in this paper were drawn from three parallel intervention studies that examined SCL efficacy within the first of these models (see Butler, 1995; 1998b; in press). In each, individualized tutoring was provided to students for at least one semester and for up to one year. Participants were a diverse set of post-secondary students between the ages of 19 and 48 ($\underline{N}$ = 34 across studies). Each student chose a task of importance in his or her academic work and brought actual assignments to tutoring sessions. The tasks chosen by students across the three studies were most often variants of reading and studying ($\underline{n}$ = 12), writing ($\underline{n}$ = 13), and/or math problem solving ($\underline{n}$ = 8) tasks.

Each study comprised a series of in-depth case studies embedded within a pre-posttest design. For each case, pre- and posttest questionnaires and interviews measured students' metacognitive understandings about tasks, strategies, and monitoring, perceptions of self-efficacy, and attributions for successful and unsuccessful performance. Throughout the intervention, data were collected to measure students' task performance, strategy use within and outside of sessions, and involvement in strategy development. Changes in students' strategies also were traced across time. Taken together, results from the three studies provided evidence for SCL efficacy as a model for individualized tutoring (see Butler, 1998b; in press). Improvements were observed in participants' task performance, perceptions of task-specific self-efficacy, and some attributional beliefs. At posttest, students also were better able to articulate metacognitive knowledge about tasks, strategies, and monitoring than they had been at pretest, and their posttest strategy descriptions were more focused and linked to task demands. Results also showed that, in general, students were actively involved in strategy development, generated and evaluated strategy steps independently, and transferred strategy use across contexts. Finally, a majority of students reported developing and/or adapting strategic approaches for use across non-instructed tasks.

Thus, findings from these studies suggest that individualized tutoring based on the SCL model can be associated with improvements in self-regulation by postsecondary students with LD's. However, because no comparative studies have been completed contrasting SCL to other instructional variants, conclusions regarding the relative efficacy of SCL are not warranted. And, given the positive findings from extensive research on alternative models that share core characteristics with SCL (e.g., Graham & Harris, 1989; Palincsar & Brown, 1984; Pressley et al., 1995), it is currently safest to conclude that alternative approaches exist that promote academic self-regulation. Nonetheless, SCL research does challenge the oft-held assumption that direct instruction and modeling of task-specific strategies are necessary components of effective strategy instruction. Future research should explore whether certain instructional variants are more useful for students with different experiences and needs (e.g., young children developing literacy skills vs. adult students with LD's).

SCL: An Instructional Analysis

Given the positive findings within the three studies described above, a discourse analysis of SCL instruction was completed with three complementary objectives: to characterize SCL as it was implemented in practice; to assess whether the process of instruction was consistent across two tutors and four students; and to evaluate whether observed instructional characteristics were consistent with the model's theoretical description (see Kamann & Butler, 1996). Building on that analysis, and informed by the efforts of other educational researchers interested in the dynamics of strategy-based instruction (e.g., Gaskins, Anderson, Pressley, Cunicelli, & Satlow, 1993; Duffy, Roehler, & Rackliffe, 1986), a more sophisticated, multi-level analysis of the same data was undertaken. This paper presents a preliminary report of findings from this more extensive analysis (for a full report see Butler, Kamann, Poole, & Elaschuk, 1998). In this report, the primary objective is to elaborate understanding regarding the relationship between SCL instruction and students' development of self-regulated approaches to tasks.

Procedure

In the original discourse analysis, four cases were selected from the pool of students taking part in the three intervention studies. A first tutor had worked with three of the students; A second tutor (the present author) had worked with one. All participants were female. Each had received tutoring for between 11 and 23 sessions. Tasks chosen by the four students included math problem solving (n = 1), writing (n = 2), and reading and studying (n = 1). For each of the four students, one audiotaped intervention session was selected from three time periods: early, middle, and late in the intervention period. For his students, the first tutor transcribed three 20-25 minute segments from each intervention session, one from the beginning, middle, and end of each tape. The second tutor randomly selected and transcribed one 20-25 minute segment from each of her three tapes.

Transcripts from each session were parsed into a series of exchanges. An exchange was defined as the smallest unit of teacher-student interaction that could stand by itself. Exchanges were delineated not by content (since several exchanges could be strung together on a particular subject), but by the structure of interaction represented within the exchange. A new exchange was signaled whenever one participant made a statement that set the direction for the discussion (e.g., the teacher asked a question). Subsequent statements were included in the exchange only if they directly followed that lead (e.g., the student directly responded to the instructor's statement, and the teacher then confirmed the student's response). Three researchers worked collaboratively to identify criteria for parsing transcripts into exchanges. Then two researchers independently parsed the same transcripts. When acceptable levels of inter-rater agreement were reached, showing that the defined criteria were meaningful, two researchers worked collaboratively to parse the full set of transcripts. Transcripts also were parsed at the level of *statements.* A statement was defined as the expression of "a single, coherent, complete thought (which could be simple or complex, grammatically, with clauses)". Criteria for parsing transcripts also were developed and refined (see Butler et al., 1998). Inter-rater reliability when applying the statement parsing criteria was 97%.

Table 1. Codes used to describe the content of teacher and student statements.

Category	Category description.
Task	Working on a task (e.g., reading out loud, doing math problems, listing essay ideas).
Task/Process	Working on both the task and the process of completing the task, including any discussions of task demands, strategies, or monitoring (e.g., "when you use this strategy you would [demonstration or thinking aloud]" or "This math question involves a bit of calculation...kind of like [demonstration]."
• Task Definition	• Centers on identifying task requirements and/or defining performance criteria
• Strategy Development	• Centers on processes students engage to complete tasks
• Monitoring	• Centers on how task completion is proceeding (e.g., whether students understand or are confused; the ease of task completion; checking work)
• Volition Control	• Identifies distractions or disruptions; discusses how to maintain focus on a task or overcome obstacles to task completion
Organizational	Focuses on organizing aspects of the session (e.g., assignments, directions), including discussions of timing of task completion and time management.
Unrelated	Discussions unrelated to a discussion of the task, the process of completing the task, or session organization (e.g., social conversation).

The parsed transcripts were then coded for content at both the statement and exchange levels. Exchanges were coded in two ways. First, exchanges were coded as having been initiated by the teacher or by the student. Second, exchanges were coded based on the focus of discussion within the exchange (e.g., on general conversation; on collaborating to complete a task). Student and teacher statements also were coded in two different ways. First, statements were coded based on the *function* of the statement within teacher-student interactions (e.g., whether an instructor's comment functioned to provide an explanation, guide student processing, or affirm a student response). Second, statements were coded based on the *content* addressed (e.g., task completion or the process of completing the task). This dual coding allowed for analysis of relationships between the function and content of particular statements (e.g., whether instructors provided direct explanations focused on the process of task completion). Procedures for deriving coding criteria were the same for each set of codes. Several researchers worked together to develop the codes based jointly on (1) theoretical understandings regarding self-regulated processing and characteristics of instructional interventions and (2) an inductive analysis of the data being reviewed. Codes then were applied independently by at least two researchers to a subset of transcripts and refined until acceptable reliability was achieved. Finally, two raters independently coded the transcripts, compared results, and resolved any disagreements. Using these procedures, inter-rater agreement was between 89% and 97% for each set of codes. Fuller descriptions of coding criteria are presented in the Tables below.

Results and Discussion

One goal in the new SCL instructional analysis was to characterize how self-regulated processing was supported within the context of meaningful tasks. Several analyses reported in this section speak to that general question. To begin, Table 1 presents the codes used to categorize the content of teacher and student statements. Statements were coded as focusing either purely on task completion (e.g., brainstorming ideas for an essay; working through a math problem), on a discussion of learning processes while completing the task (e.g., on what strategies might be useful when planning an essay's content), on organizing sessions, or on unrelated conversation. Statements that focused on the process of task completion (the "*task/process*") were further differentiated based on the kind of process addressed. Task/process statements were identified as focusing on task definition, strategy development, monitoring, or volition control.

Table 2. Number of teacher and student statements focused on different topics during SCL exchanges.

Content Discussed	Teacher Statements		Student Statements		Total Statements	
	Total #	% of teacher statements	Total #	% of student statements	Total #	% of all statements
Task	569	34%	800	44%	1369	39%
Task/Process						
Task Definition	95	6%	56	3%	151	4%
Strategy Development	417	25%	271	15%	688	20%
Monitoring	323	19%	395	22%	718	21%
Volition Control	6	0%	8	0%	14	0%
TOTAL	841	51%	730	40%	1571	45%
Organization	136	8%	135	7%	271	8%
Unrelated	117	7%	151	8%	268	8%
TOTAL	1663		1816		3479	

Table 2 presents the number of teacher and student statements (across all four students and across early, middle, and late sessions) that focused on each of these topics. These data suggest that, as expected, teacher-student collaborations shifted between a focus on task completion and discussions about the process of completing a task. Students' attention was focused equally on task completion (44% of their statements) and task/process (40% of their statements). In contrast, teacher statements focused more often on task/process (51%) than on working through the task (34% of teacher statements). This finding was not surprising, given that the instructors' role was to support strategic processing.

Overall, 45% of all statements made by teachers and students were focused on the task/process. Most of these task/process statements targeted strategy development (20% of all statements) or monitoring (21% of all statements). Few statements focused on volition control. Further, only 4% of statements were focused on task definition. This latter finding was unexpected, given the centrality of task analysis in the SCL model. It may be that, once task criteria were defined, repeated statements focused on task analysis were unnecessary. Attention would logically shift to evaluation of performance and strategy usefulness in light of task goals (leading to the large number of statements focused on monitoring). Further, when strategies were developed for more effectively deciphering tasks (e.g, how to read and interpret assignment instructions), statements were categorized under "strategy development".

A second goal in the present analysis was to describe the roles of teachers and students within interactive exchanges. Table 3 presents two types of data that speak to this second question. First, data are presented summarizing the number of exchanges initiated by students and teachers within early, middle, and late sessions. These data show that, in early sessions, teachers were more likely to structure discussion (by initiating 61% of exchanges). In middle and late sessions, however, initiations by teachers and students were closer to equal (approximately 55% of exchanges initiated by teachers vs. 45% by students). Second, data are also presented summarizing the total number of statements made by teachers and students. These data suggest that, in all sessions, students and teachers contributed equally to the quantity of discussion. Of 3479 statements made overall, 48% were made by teachers and 52% were made by students. Taken together, these data suggest that, while teachers were slightly more likely to direct the flow of discussion, students and teachers participated equally in terms of the quantity of what was said.

Table 3. Instructor and student roles during early, middle, and late instructional interactions.

Time of Session	Initiation of the Exchange[1]				Number of Statements Made			
	By Teachers		By Students		By Teachers		By Students	
	# of exchanges	% of all exchanges	# of exchanges	% of all exchanges	# of statements	% of all statements	# of statements	% of all statements
Early	247	61%	161	39%	682	46%	797	54%
Middle	172	55%	139	45%	543	51%	520	49%
Late	151	56%	117	44%	438	47%	499	53%
Total	570	58%	417	42%	1663	48%	1816	52%

[1] T = teacher; S = student.

To further clarify instructors' roles in SCL instruction, the function of teacher statements was defined. Statements were identified as providing direct instruction (explanation, modeling, or evaluating regarding task performance or learning processes), four types of guidance (open, specific, cueing, or structuring), or support (through statements that paraphrased, summarized, or encouraged student statements). Some statements asked for clarification (of the student's or instructor's understanding). Others focused on the organization of sessions or unrelated topics. Table 4 presents a summary of the coding criteria used for categorizing the function of teacher statements.

Table 4. Codes used to categorize the function of instructor statements.

Category	Category description and examples.
Direct Instruction	
Explaining	Tells the correct response, explains some content to the student, answers the student's question, or directly tells the student how to do something. *Examples: "Do you see how this would be good strategy...?"; "The answer to your question is..."*
Modeling	Talks through, demonstrates, and/or thinks aloud a certain task for the student. *Examples: "When you use this strategy you would [demonstration or thinking aloud)"; "This math question involves a bit of calculation...kind of like [demonstration]".*
Evaluating	Accepts or rejects a student response; the teacher passes judgment and makes an evaluative decision regarding student responses or tasks (e.g., personal opinion). *Examples: "No, that strategy does not work for you"; "Yes, you did do that math question right."*
Guiding	
Specific	Leads the student in a direction in terms of content or process and helps them to formulate a response without telling them directly what to do. *Examples: "What strategies do you think you could use to help you understand?"; "So, do you mean that you want to use that strategy or [teacher adds something]"; "Who do you think the main character is...?"*
Open	Provides an opening statement in order to encourage thinking, discussion, or action. This category is reserved for statements wherein no direction is implied. If there is any implied direction, refer to guiding (specific). *Examples: "What are you going to do now?";"What do you think?"; "Why...so...well..."*
Cueing	Prompts students to think of something established previously so they can think about it in the current context. *Examples: "Remember that strategy you used before..."; "What about the character we discussed before..?"*
Structuring	Organizes, focuses, or structures the discussion or tasks, pulling things together. *Example: "Why don't you go through those pieces of paper and neaten it up?"*

Supporting Paraphrasing	Literally rephrases what the student says to capture the student's perspective. *Examples: "So, what you mean is..." [The teacher repeats the student response, but adds no additional information].*
Encouraging	Provides encouragement or affirmation for the student to formulate responses and ideas, but does not pass judgment regarding right or wrong answers or make any evaluation regarding student answers. *Examples: "That's very good thinking"; "Uh huh"; "Okay"; "I see"; "Right"; "Good" (non-evaluative).*
Summarizing	Summarizes what the student has done; often an opener to discussions. Paraphrases work done in the past; synthesizes and synopsizes written material completed by the student. *Example: "I can see where you've elaborated to make things clearer."*
Clarifying Clarifying	Asks the student to repeat or rephrases what the student said in order to clarify; this is to ensure that the teacher understands the student. Gets information from the student to clarify their own understanding. *Example: "I am confused about something...can you repeat that?"; "I don't know what you mean"*
Checking Student Understanding	Asks the student to confirm that they understand tasks, instructions, etc. *Example: "Do you know what I mean?"*
Procedural	Focuses on organizing aspects of the session (e.g., assignments, directions).
No Code	Aborted statements that serve no function.

Table 5a presents a summary of the frequency of instructor statements that served each function, both in total and broken down by statement content. Overall, these data show that very few instructor statements provided direct explanations or modeling (4% and 1% of all teacher statements, respectively). These statements were equally likely to be targeted at task completion or the task/process, so that, combined, explaining and modeling statements on task/process comprised only 2% of all instructor statements. These data confirm that, in SCL, students' problem solving was not primarily supported using direct explanations and modeling. Instead, the majority of instructors' statements provided guidance or support (43% and 39% of statements, respectively). The most frequent statements (considering function and content) were: (1) guiding task process (25% of statements); (2) supporting task process (18% of statements); and (3) guiding or supporting task completion (14% of statements for each).

Table 5a. Frequency of each type of instructor statement focused on different topics.

Topic	Task		Task/Process		Organ.		Unrelated		TOT.	
Statement Function	#	%[1]	#	%[1]	#	%[1]	#	%[1]	#	%[1]
Direct Instruction										
Explaining	33	2%	37	2%	0	0%	2	0%	72	4%
Modeling	13	1%	8	0%	0	0%	0	0%	21	1%
Evaluating	19	1%	38	2%	1	0%	3	0%	61	4%
TOTAL	65	4%	83	5%	1	0%	5	0%	154	9%
Guiding Processing										
Specific Guidance	185	11%	298	18%	29	2%	18	1%	530	32%
Open Guidance	13	1%	33	2%	5	0%	10	1%	61	4%
Cueing	25	2%	47	3%	5	0%	1	0%	78	5%
Structuring	4	0%	31	2%	16	1%	2	0%	53	3%
TOTAL	227	14%	409	25%	55	3%	31	2%	722	43%

Supporting Processing										
Paraphrasing	42	3%	51	3%	11	1%	9	1%	113	7%
Encouraging	169	10%	217	13%	28	2%	50	3%	464	28%
Summarizing	25	2%	34	2%	3	0%	2	0%	64	4%
TOTAL	236	14%	302	18%	42	3%	61	4%	641	39%
Clarifying										
Clarifying	18	1%	24	1%	16	1%	8	0%	66	4%
Check Stud. Under.	11	1%	17	1%	1	0%	3	0%	32	2%
TOTAL	29	2%	41	2%	17	1%	11	1%	98	6%
Procedural	5	0%	2	0%	20	1%	2	0%	29	2%
No Code	7	0%	4	0%	1	0%	7	0%	19	1%
Total Statements	569	34%	841	51%	136	8%	117	7%	1663	100%

Table 5b presents a breakdown of the function of instructor statements focused on different aspects of the task/process. These data show that, of instructor statements focused on task/process (51% of all instructor statements), most focused on strategy development, followed by monitoring and then task analysis (25%, 19%, and 6% of all instructor statements, respectively). The most frequent statements (considering both function and content) were (1) guiding comments focused on strategy development (16% of instructor statements), (2) supporting statements focused on monitoring (10% of statements), and (3) supporting statements focused on strategy development (7% of statements).

Table 5b. Frequency of instructor statements focused on aspects of the task/process.

Topic	Task Definition		Strategy Development		Monitoring		Volition Control		TOT.	
Statement Function	#	%[1]	#	%[1]	#	%[1]	#	%[1]	#	%[1]
Direct Instruction										
Explaining	10	1%	21	1%	6	0%	0	0%	37	2%
Modeling	6	0%	0	0%	2	0%	0	0%	8	0%
Evaluating	0	0%	4	0%	34	2%	0	0%	38	2%
TOTAL	16	1%	25	2%	42	3%	0	0%	83	5%
Guiding Processing										
Specific Guidance	50	3%	180	11%	65	4%	3	0%	298	18%
Open Guidance	1	0%	22	1%	10	1%	0	0%	33	2%
Cueing	5	0%	33	2%	9	1%	0	0%	47	3%
Structuring	2	0%	25	2%	4	0%	0	0%	31	2%
TOTAL	58	3%	260	16%	88	5%	3	0%	409	25%
Supporting Processing										
Paraphrasing	2	0%	27	2%	22	1%	0	0%	51	3%
Encouraging	13	1%	68	4%	135	8%	1	0%	217	13%
Summarizing	2	0%	23	1%	9	1%	0	0%	34	2%
TOTAL	17	1%	118	7%	166	10%	1	0%	302	18%
Clarifying										
Clarifying	2	0%	10	1%	11	1%	1	0%	24	1%
Check Stud. Under.	1	0%	1	0%	15	1%	0	0%	17	1%
TOTAL	3	0%	11	1%	26	2%	1	0%	41	2%
Procedural	0	0%	1	0%	0	0%	1	0%	2	0%
No Code	1	0%	2	0%	1	0%	0	0%	4	0%
Total Statements	95	6%	417	25%	323	19%	6	0%	841	51%

[1] Percentage of all instructor statements.

In addition to direct explanations and modeling, many approaches to strategy instruction place teachers in an evaluative role. In contrast, in theoretical descriptions of SCL, instructors are described as guiding students to learn how to self-evaluate task performance (in light of task goals) and the efficacy of learning approaches. Consistent with this description, only 4% of all instructor statements were evaluative: 1% focused on task completion; 2% focused on task/process (see Table 5a). In contrast, 19% of all instructor statements targeted students' monitoring (see Table 5b). Two percent of instructor statements evaluated students' monitoring, 5% guided students' monitoring efforts, and 10% were supportive of students' self-monitoring statements.

In sum, the data presented so far suggest that, consistent with descriptions of the SCL model, students' self-regulated processing was supported in the context of meaningful work. Discussions moved between a focus on the task and on the process of task completion. Instructors supported students' processing, not by providing direct instruction and modeling, but rather by guiding and supporting students' cognitive activities. Further, rather than evaluating students' progress directly, instructors supported students to self-evaluate task performance and strategic processing.

Data analyses also were conducted to define students' roles in collaborative interactions. Table 6 presents the coding criteria used to classify the function of student statements. Student statements functioned to request direction, respond directly to instructor statements, report on work students had done, generate ideas, comment reflectively, support instructor statements, request clarification, confirm teacher understanding, or organize work during the sessions. Table 7a reports the frequency of statements that served each of these functions. These data show that, overall, student statements most commonly functioned to (1) generate ideas (30% of student statements), (2) comment reflectively (24% of statements), (3) respond directly to instructor statements (19% of statements), or (4) report back on work completed (14% of statements). Note that a full 40% of student statements involved either generating ideas or reflective commentary. This is in contrast to only 19% of statements that comprised direct responses.

More detailed analyses of student statements revealed more specific patterns. For example, the data presented in Table 7a show that, of the 44% of student statements focused on task completion, most involved generating ideas (23% of all student statements) or reflective commentary (8% of all student statements). Only 5% of statements comprised direct responses. These findings suggest that students were actively thinking through tasks with only some direct support from instructors. In contrast, 12% of all student statements were direct responses about the task/process. This suggests that teachers played a more active role in guiding students' cognitive processing (as the vehicle for influencing task performance). At the same time, 11% of all student statements involved reflective commentary on the task/process. This finding suggests that students also were actively involved in developing and monitoring strategies. This latter conclusion is further supported by the data in Table 7b. That table summarizes the frequency of student statements focused on different aspects of the task/process. Those data show that, overall, 15% of student statements targeted strategy development and 22% focused on monitoring. More specifically, the most frequent foci of student statements on the task/process were (1) reflective comments on monitoring (10% of all student statements), (2) direct responses focused on strategy development (5% of statements), or (3) direct responses focused on monitoring (5% of statements).

Table 6. Codes used to categorize the function of student statements.

Category	Category description and examples.
Requesting Direction	Asks for guidance in terms of the correct response or an explanation regarding process or content. *Examples: "I don't know what to do."; "Which strategy would work best here?"*
Direct Response	Directly responds to a teacher statement or questions. *Example: The teacher asks "Why?", and the student responds, "Cause it just didn't seem right."*
Reporting	Describes or recites details of work they have done. This can be either process or content focused. This may include a summarizing of their work. *Examples: "I just went from my notes and I compared what was in my textbook."; "What I used for sodium potassium chloride and bicarbonate, I put 'some purple cars blow up'."*
Generating Ideas	Engages in verbal dialogue with self or instructor, consisting of a series of questions or statements about the task as they work through it. The student may also be trying out new ideas or strategies. The student is thinking aloud. *Examples: "Oh, I get this...the first thing I do is...take a step back..."; "What is my first step in completing this question...?"*
Reflective Commentary	Reflective comments regarding tasks, process, or teacher comments. These reflective comments are often thrown in randomly. *Example: "It's gonna be really easy to study this."*
Supporting	Responses that indicate the student is listening and engaged in participation, but which are not intended to direct the discussion. These are usually closed statements (i.e., to finish sentences). *Example: "Right."; "Okay."; "That's good."*
Clarifying	Asks the teacher to elaborate on either process or content in order to further their own understanding. The student may also repeat or rephrase what teacher has said to ask for clarification. *Example: "So...what you mean is..."*
Checking Teacher Understanding	Asks the teacher to confirm that they understand what the student has said. *Example: "Do you know what I mean?"*
Procedural	Focuses on organizing aspects of the session (e.g., assignments, directions). *Example: "I have four assignments due this week."*

In sum, the data presented in Tables 7a and 7b show that a large proportion of student statements were focused on generating ideas, reflecting about their task performance, and/or reflecting about task processes. In contrast, only half as many statements comprised direct responses to instructors. When students did provide direct responses, they were more often focused on task/process than they were on completing the task. And, although they responded directly to instructor statements, they also generated reflections about learning. Finally, students' task/process statements most frequently focused on self-monitoring and strategy development. Taken together, these patterns suggest that the students were active participants during collaborative problem solving. They were actively involved in thinking through tasks, discussing strategic approaches, and evaluating outcomes.

Table 7a. Frequency of each type of student statement focused on different topics.

Topic	Task		Task/Process		Organ.		Unrelated		TOT.	
Statement Function	#	%[1]	#	%[1]	#	%[1]	#	%[1]	#	%[1]
Requesting Direction	7	0%	12	1%	1	0%	3	0%	23	1%
Reporting	77	4%	123	7%	38	2%	18	1%	256	14%
Direct Response	92	5%	210	12%	32	2%	15	1%	349	19%
Generating Ideas	409	23%	125	7%	7	0%	7	0%	548	30%
Supporting	49	3%	57	3%	15	1%	20	1%	141	8%
Clarifying	9	0%	6	0%	1	0%	0	0%	16	1%
Checking Teacher Understanding	1	0%	1	0%	0	0%	1	0%	3	0%
Reflective Commentary	140	8%	194	11%	29	2%	77	4%	440	24%
Procedural	1	0%	1	0%	12	1%	0	0%	14	1%
No Code	15	1%	1	0%	0	0%	10	1%	26	1%
Total Statements	800	44%	730	40%	135	7%	151	8%	1816	100%

Table 7b. Frequency of student statements focused on aspects of the task/process.

Topic / Statement Function	Task Definition		Strategy Development		Monitoring		Volition Control		TOT.	
	#	%[1]	#	%[1]	#	%[1]	#	%[1]	#	%[1]
Requesting Direction	1	0%	1	0%	10	1%	0	0%	12	1%
Reporting	6	0%	66	4%	51	3%	0	0%	123	7%
Direct Response	27	1%	91	5%	86	5%	6	0%	210	12%
Generating Ideas	13	1%	63	3%	49	3%	0	0%	125	7%
Supporting	5	0%	34	2%	17	1%	1	0%	57	3%
Clarifying	0	0%	3	0%	3	0%	0	0%	6	0%
Checking Teacher Understanding	0	0%	0	0%	1	0%	0	0%	1	0%
Reflective Commentary	3	0%	13	1%	177	10%	1	0%	194	11%
Procedural	1	0%	0	0%	0	0%	0	0%	1	0%
No Code	0	0%	0	0%	1	0%	0	0%	1	0%
Total Statements	56	3%	271	15%	395	22%	8	0%	730	40%

[1] Percentage of all student statements.

The final set of analyses to be reported here focused on the topics covered within exchanges. Table 8 provides a summary of content codes assigned to interactions at the exchange level. In general, exchanges could be described as focusing primarily on casual conversation, assessing student progress (if initiated by instructors), self-monitoring progress (if initiated by students), or collaboration. For all of the codes but conversation, exchanges also were identified as focusing on task completion or on strategy development.

Table 8. Codes used to describe the focus of exchanges for teacher and student initiated exchanges.

Category	Category description and examples.
Conversation	Teacher or student initiated discussions that do not relate to task or strategy development and progression (i.e., personal communication). *Example: The teacher says, "Okay, what's up?" and the student responds, "Um...I worked last night and am really tired."*
Assessing Progress	Teacher initiated discussions designed to determine the students' progress and academic development.
Task	Discussions focused on assessing task performance. *Example: "So, how did you do on the decimals assignment last week?"*
Strategy	Discussions focused on assessing strategies and strategy effectiveness. *Example: "How did that decimal strategy work for you that we developed last week?"*
Self-Monitoring	Student initiated discussions reporting on their progress and academic development.
Task	Discussions focused on describing qualities of task performance. *Example: "I really understood that short story that we worked on last week."*
Strategy	Discussions focused on evaluating strategies and strategy effectiveness. *Example: "That decimal strategy is really working well for me."*

Collaborating	Teacher or student initiated discussions during which they jointly work to complete the student's task and/or to develop better approaches for task completion.
Task	Discussions focused on completing a task. *Examples: Teacher- "What other number do you know automatically goes into any number?"; Student - "Two doesn't go into 9 so it has to be 3, cause 3 times 3 is 9."*
Strategy	Discussions focused on developing better strategies for task completion. *Example: Teacher - "Why don't we come up with a strategy so you remember what's important to include?"; Student - "If I circle the noun in this sentence, it seems to clue me into the subject in the paragraph."*

Table 9 presents the frequency of exchanges that focused on each of these topics, within teacher-initiated exchanges, within student-initiated exchanges, and in total. [Note that, by definition, a close relationship existed between the codes assigned (i.e., assessing progress or self-monitoring) and the initiation of an exchange (by a teacher or a student). This was because the distinction between assessing progress and self-monitoring rested on who initiated the discussion. Recall, however that parsing of exchanges in transcripts was determined, not by content, but by function. As a result, there were times when one person initiated an exchange in an open enough way to allow the other person to guide the discussion (e.g., a teacher initiated an exchange by saying, "What's up" and the student's response initiated a discussion about task progress.)]

The data presented in Table 9 show that, overall, students and instructors worked collaboratively in 74% of exchanges, either to complete particular tasks (in 52% of exchanges) or to develop strategic approaches to learning (in 22% of exchanges). Like analyses on statement content, this finding suggests that instructors and students collaborated to build strategies in the context of meaningful academic work. Further, this finding elaborates how instructors provided on-line support to shape students' problem solving approaches. For example, it appears that 3/4's of instructional time was spent in collaborative discussions. In two thirds of those discussions (fully half of all exchanges), attention focused on completing assignments. One third of the collaborative discussions (22% of exchanges overall) were used to develop strategies. Further, note that students and teachers were equally likely to initiate exchanges focused on tasks. In contrast, teachers were much more likely to initiate exchanges focused on strategy development (19% of all exchanges) than were students (3% of all exchanges). This finding also is consistent with analyses (described earlier) on the content of teacher statements. Again, those analyses showed that teachers talked more about the task/process than they did about tasks (see Table 2). So, while students were equally focused on tasks and task/processes, instructors supported students' task performance by initiating and/or focusing discussions on strategies.

The data presented in Table 9 also show that, while 74% of exchanges involved collaborative work, 16% of exchanges focused on assessing student progress. This finding suggests that discussions within and across sessions shifted flexibly between cognitive engagement in tasks and reflection on associated outcomes. Note, too, that discussion was equally likely to focus on assessing task performance (8% of exchanges) and evaluating strategies (9% of exchanges). Finally, note that students and teachers were equally likely to initiate conversations that assessed progress, both about task performance and about strategies. This equality was evidenced by the findings that (1) equal numbers of exchanges in which progress was assessed were initiated by teachers and students; and (2) the numbers of exchanges coded as self-monitoring or assessing progress, respectively, also were close to equal. At the same time, although instructors may have initiated discussions focused on assessing student progress, recall that few instructor *statements* provided direct evaluations. Instead, instructors were more likely to provide support by encouraging or guiding students' monitoring (see Table 5b). Taken together, these findings suggest that, during interactive discussions, students frequently initiated and/or were guided to generate internal feedback about progress (see Butler & Winne, 1995).

Table 9. The focus of discussion within teacher and student initiated exchanges.

Exchange Pattern / Focus of Discussion	Teacher initiated exchanges		Student initiated exchanges		TOTAL	
	#	%[1]	#	%[1]	#	%[1]
Conversation	47	5%	50	5%	97	10%
Assessing Progress						
Task	29	3%	1	0%	30	3%
Strategy	45	5%	0	0%	45	5%
TOTAL	74	7%	1	0%	75	8%
Self-Monitoring						
Task	0	0%	46	5%	46	5%
Strategy	7	1%	34	3%	41	4%
TOTAL	7	1%	80	8%	87	9%
Assessing Progress & Self-Monitoring Combined						
Task	29	3%	47	5%	76	8%
Strategy	52	5%	34	3%	86	9%
TOTAL	81	8%	81	8%	162	16%
Collaborating						
Task	255	26%	257	26%	512	52%
Strategy	187	19%	29	3%	216	22%
TOTAL	442	45%	286	29%	728	74%
Total Exchanges	570	58%	417	42%	987	100%

[1] Percentage of all exchanges.

In sum, the findings reported here describe the qualities of student-teacher interactions within SCL instruction. The findings illuminate how instructors promoted more strategic approaches in the context of meaningful work. The findings also clarify how discussion shifted responsively between collaborating on tasks and reflecting on progress and outcomes. Consistent with descriptions of the SCL model, instructors appeared to provide assistance primarily by guiding and/or supporting students' cognitive processing and by supporting students to self-monitor. Students' roles were to actively think through tasks and to reflect on the process of learning.

Self-Regulated Processes Captured in Students' Strategies

One additional source of evidence clarifies the relationship between SCL instruction and students' development of more effective approaches to tasks. In each of the three SCL studies described earlier, students were asked to define, try out, and evaluate strategies designed to complete task objectives. Whenever students tried out a strategy that worked and that they thought would be useful in the future, they were asked to describe what they did. Students' strategy descriptions were transcribed verbatim (and/or were written down by the students themselves). These strategy records allowed for subsequent tracing of the evolution of each student's strategies (see Butler, in press).

Analyses of the strategy data showed, first, that students were actively involved in strategy development (see Butler, in press). For example, 82% of participants were observed to independently modify or invent task-specific strategies at some point during the intervention and 71% of the students spontaneously described adapting strategic approaches for use across non-instructed tasks. The strategy data also confirmed that strategies built from students' extant understandings. For example, 69% of the strategy steps articulated at pretest were retained in students' final strategies (17% were modified or extended and only 14% were dropped). At the same time, only 9% of final strategy steps were those that students identified at pretest. The remaining strategy steps were developed collaboratively (70% of the steps) or were developed independently by students (21%).

Finally, inspection of students' final strategies confirmed that, although students who worked on similar tasks developed strategies with clear similarities, their strategies were individualized (see Butler, in press). Strategies were similar in the sense that they reflected common task requirements and key self-regulating processes. For example, reading strategies tended to include steps focused on targeting information to be read (e.g., doing research), building meaning, monitoring comprehension and/or repairing comprehension problems, note taking, and studying. Math strategies focused on representing problems, problem solving procedures, monitoring accuracy, and studying. Writing strategies focused on planning, generating text, and revising. These findings were significant because they showed (1) that the strategies students developed were responsive to task demands, and (2) that students' strategies reflected the key self-regulated processes that focused instructional dialogues. At the same time, students' strategies were individualized in that they emphasized different task elements (based on students' particular difficulties). How students chose to accomplish a particular objective (e.g., planning an essay) also was driven by their personal strengths, preferences, and needs (e.g., some students planned by making webs while others chose to make outlines). Finally, strategies were individualized in that they were expressed in the students' own words.

Conclusions and Implications

This paper has examined the nature of instruction that can be associated with students' development of self-regulated approaches to academic tasks. To begin, it was argued that mature self-regulation depends on a constellation of competencies, knowledge, and beliefs that develop at different rates (Butler & Winne, 1995). As a result, supporting self-regulation requires a long-term effort that helps students channel problem solving activities effectively in the context of academic tasks, construct productive metacognitive knowledge and motivational beliefs, shift strategically between fluent cognitive performance and reflective self-regulation, and recognize links between generalized understandings about learning and situated strategic performance. The bulk of the paper described research on one model designed to support self-regulated learning, the Strategic Content Learning (SCL) approach. In that research, SCL tutoring has been associated with positive outcomes when applied to support postsecondary students with LD's (see Butler, 1993; 1995; in press). Given the success of the SCL model, findings from an instructional analysis were reported as was a summary of students' strategy development (see Butler, in press). In this final section, conclusions are summarized in order to characterize *how* SCL works.

How did SCL support students to develop the competencies, knowledge, and beliefs upon which self-regulated learning depends? First, evidence suggested that instructors shaped students' problem solving on-line within the context of meaningful work. That instruction was situated in meaningful work was evidenced by the content of statements and exchanges. Student statements expressed ideas and commentary that reflected active engagement in tasks. Exchange level data showed that collaborative discussions shifted between task completion and strategy development. That instructors built from students' extant problem solving abilities was evidenced by analyses of students' final strategies. Those analyses showed that pretest strategy steps were retained, modified, and/or dropped by students as they constructed improved, individualized strategies.

Second, SCL instruction was associated with positive shifts in students' metacognitive knowledge and motivational beliefs. Instructional activities that have been associated with these kinds of gains were evident in the SCL instructional analysis. For example, students were asked to articulate understandings about tasks, strategies, and monitoring based on concrete learning experiences. Researchers have suggested that abstracted understandings drawn from experience form the basis for metacognitive knowledge (Borkowski, 1992; Campione et al., 1988; Flavell, 1987; Paris & Byrnes, 1989). Further, SCL participants were supported to implement strategies, generate internal feedback about progress, and correlate improved performance with effortful strategy use. Researchers have found that these are activities that promote self-perceptions of competence (Paris & Byrnes, 1989; Schunk & Cox, 1986) and positive attributional beliefs (e.g., Borkowski et al., 1988).

Third, evidence suggests that SCL participants were supported to shift between task performance and reflective self-regulation. For example, instructors' statements were found to direct students' attention to learning processes and/or the success of learning activities. Students' statements often provided reflective commentary or assessments regarding tasks and/or task processes. Finally, exchange level data showed that discussions shifted between task completion, strategy development, and progress assessment.

Finally, evidence from SCL research clarifies how students were assisted to construct generalized understandings about learning based on contextualized learning experiences. Evidence that students abstracted understandings about strategies was provided by pre- and posttest assessments of metacognition as well as by students' strategy records (see also Butler, in press). In addition, interview responses given by participants in another SCL study (see Butler, 1993; 1995) explained why they found their individualized strategies so meaningful. Specifically, they said that they understood how and why to use their strategies because (1) they remembered what they were doing when they developed the strategies as well as why the strategy steps were generated; (2) the strategies were "personalized" and responsive to their unique strengths and needs, and (3) the strategies were expressed in terms that they could understand (i.e., in their own words).

Thus, SCL appears to support self-regulation by providing calibrated support to students as they self-regulate performance in the context of meaningful academic tasks. Instructors use task analysis and monitoring as a framework for structuring collaborative discussions within which individualized strategies are developed. The majority of evidence described in this paper are consistent with this general description. The only exception was that fewer statements than expected focused on task description. Other types of evidence, however, suggested that instructors collaborated with students to develop and evaluate strategies based on an understanding of tasks. For example, instructors initiated discussions about strategies and supported students to self-monitor (performance outcomes *and* strategy efficacy). Students developed individualized strategies with steps that reflected task demands. Measures of metacognition revealed gains in students' ability to articulate descriptions of tasks, strategies, and monitoring. Further, those strategy descriptions were more focused and linked to task-specific requirements.

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