PROMOTING STRATEGIC LEARNING BY ADULTS WITH LEARNING DISABILITIES: AN ALTERNATIVE APPROACH

by

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Abstract

In cognitive intervention research, the intent of instruction is not just to promote expert use of a set of procedures or heuristics for completing a task. The expectation is, rather, that students will somehow become strategic learners who flexibly select, implement, evaluate, and adapt task-appropriate strategies as required. In short, effective learners are self-regulating. The research described here investigated the effectiveness of an intervention program designed to promote self-regulated learning, Strategic Content Learning (SCL). In SCL, rather than teaching students specific cognitive strategies, instruction focuses on supporting students to approach learning tasks *strategically*. The study was comprised of six parallel case studies embedded within a single group, pre-post design. Participants were 6 adults with learning disabilities enrolled in post-secondary education programs. Each student chose a task that was of importance in current or future academic work and individualized support was provided within that context. Results indicate first, that in all cases students' performance on their chosen task improved. More importantly, evidence suggests that students became more self-regulated in their learning: they were active in developing and modifying strategies in response to task demands, they independently applied strategies across contexts and over time, and they began to attack non-instructed tasks strategically. Data also reveal gains in metacognitive knowledge about tasks and strategies, increased perceptions of self-efficacy, and shifts in attributional patterns. Based on interview data, students identified elements of the approach they felt were most beneficial. These included their active involvement in thinking through tasks and in reflecting on their performance, the development of strategies that were personalized, a positive focus on what they *could do* when building strategies, and the development of strategies that made sense to them and were expressed in their own words. The particular suitability of SCL as an intervention for adults with learning disabilities is described, and implications of the findings for research and practice are discussed.

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I. INTRODUCTION

For the past decade transfer and maintenance have been priorities in learning strategies research, in part because in early studies findings of successful transfer and maintenance were elusive (Brown, Campione, & Day, 1981). Transfer and maintenance are critical, however, as they represent the goals inherent in learning strategies instruction. In general, the intent of instruction is not to promote expert use of a set of specific procedures or heuristics for completing a task. Instead, the expectation is that students will become strategic learners who flexibly select, implement, evaluate, and adapt task-appropriate strategies as required. In short, effective learners are self-regulating.

While this purpose is generally endorsed by cognitive intervention researchers, the best means to this end is disputed (e.g., Pressley, Snyder, & Carglia-Bull, 1987). Most programs take as a starting point identification of effective cognitive processing routines or strategies associated with different tasks. These routines, or strategies, are then taught to less proficient students (Wong, 1992). Where instructional models differ is primarily in terms of how these strategies should be conveyed. Advocates of direct instruction (Borkowski & Muthukrishna, 1992; Ellis, 1993; Pressley et al., 1987) argue that teachers should first explain strategy steps explicitly and model their use. This instruction should be followed by guided, then independent practice. On the other hand, proponents of sociocultural models (Englert, 1992; Palincsar & Brown, 1984) introduce and model strategies, but then engage students in interactive dialogues as they apply strategies within the context of meaningful work. Through social interactions, students are thought to internalize the cognitive processing modeled by teachers and peers.

While strategy training models differ in terms of instructional methods, each seeks to teach students one or more strategies that have been associated with successful task performance. At least four problems may arise when strategy training procedes from

this basic goal. First, when a strategy for task performance is defined, either by an instructor, a researcher, or based on an analysis of the performance of experts, this routine represents just one potentially effective approach to task completion. As Swanson (1990) notes, there are multiple cognitive means by which students might achieve the same goal, and the specific strategy defined is unlikely to be equally beneficial for all learners. For example, in several studies the learning of high ability and average students did not improve, or even declined, following strategy instruction (Graham, 1992; Swanson, 1990; Wong & Jones, 1982). Swanson (1990) argues "there is no single best strategy for LD students within or across particular domains" (p. 38).

Most researchers recognize that strategies must be personalized to meet students' needs (Borkowski & Muthukrishna, 1993; Ellis, 1993; Montague, 1993; Swanson, 1990). Two approaches to strategy individualization have been proposed. In the first, students are taught a variety of strategies from which they can later choose. However, in this option students devote scarce resources to learning strategies which do not meet their needs. An alternative is to teach one or more strategies and then encourage students to adapt or personalize them in the later stages of training (Borkowski & Muthukrishna, 1992; Ellis, 1993). This may be feasible for some students; however, research has shown that students with learning disabilities often do not independently adapt strategies to the demands of different tasks (Swanson, 1990). The challenge remains, then, to define means for effectively and efficiently individualizing strategy instruction.

Researchers have stressed the importance of embedding strategy instruction in the context of meaningful work to avoid a disassociation between strategy knowledge and the tasks where strategies are to be applied (Palincsar, Brown, & Martin, 1987; Reeve & Brown, 1985). However, even when taught in context, a second problem may arise. That is, the essential character of a strategy may be undermined if it is treated as an end of instruction rather than as a means to achieve a particular end. The instructed routine may become reified or static rather than representing a simplified description of the dynamic

process which underlies task performance. Strategic processing and self-regulated learning generally may be best characterized as flexible and adaptive responding to fluctuating task demands.

A third potential problem is related to the process by which students optimally develop an understanding about strategies and strategic learning generally. There is a growing appreciation that when learning concepts, students must actively construct understandings for themselves. However, an extension of this reasoning to cognitive strategies has not often been made. It may be important for students to construct understandings, not only about concepts, but also about the kinds of strategies they use when completing a task. Consistent with this idea, it has been suggested that one way to promote transfer is to assist students to "mindfully abstract" principles out of specific instances (Salomon & Perkins, 1989). This mindful abstraction results in the decontextualization of understandings which can then be applied across tasks and settings. Extending this argument, Wong (1991) suggested that to promote transfer of strategic processing, learners should be assisted to mindfully abstract principles about strategies. Thus, it may be that knowledge about strategies and transfer would be enhanced if students reflectively constructed understandings based on experiences with tasks. Approaches that engage students in interactive dialogues about cognitive processing in the context of meaningful work are most likely to achieve this aim (e.g., Palincsar et al., 1987).

Finally, consider who it is that is being strategic in many strategy training approaches. In many cases, it is the teacher who confronts a novel task, analyzes the task and identifies associated goals, considers the types of problems students might encounter, and defines a specific and hopefully effective routine. In this scenario, students are peripheral to the problem solving process that is at the heart of self-regulation. The student has not learned to confront a novel task, identify goals, and to brainstorm, try out, and modify a variety of approaches designed to achieve those goals. Students may

acquire little understanding about where strategies originate. They may not recognize that they, too, can generate strategic approaches and thus ultimately control their own learning outcomes.

This dissertation study investigates the effectiveness of an alternative instructional approach designed to promote self-regulated and strategic learning, Strategic Content Learning (SCL). In SCL, rather than teaching students specific strategies, students are supported to generate strategies designed to achieve personally meaningful goals. The instructor collaborates with students to define goals, based both on the nature of a task and students' specific difficulties, and to develop approaches to reach those goals. Throughout the intervention, interaction involves reflecting on processes engaged, abstracting a general description of approaches, evaluating the success of approaches in achieving goals, and modifying approaches to address obstacles. Essentially, students are provided with scaffolded support, not to learn and flexibly implement a specific strategy, but to approach tasks in a problem solving, strategic manner.

How does this alternative approach resolve the problems outlined earlier? First, students develop routines that are effective specifically for them. Second, strategies are not separated from content—students address specific tasks and approaches are tried and evaluated within that context. Further, through interactive dialogues, students are assisted to construct an understanding of their own processing as they try out approaches across related tasks. Finally, students engage in a problem solving process. By developing, evaluating, and modifying their own strategies, students gain and exercise control over their own learning.

Overview of the Research

The research reported here was comprised of six parallel case studies. Participants were adults with documented learning disabilities who were enrolled in academic or vocational programs in post-secondary institutions. The context of the study was selected first, because SCL may be particularly beneficial for adults with learning disabilities. In

comparison to their peers, learning disabled students are less likely to employ effective strategies for learning or to develop strategies for themselves (Swanson, 1990; Wong, 1986). Further, while researchers argue that adults tend to be self-directing of their learning efforts in response to particular problems or goals (Knowles, 1978; Merriam, 1987), adults with learning disabilities may be less effectively self-directing. Research indicates that the types of processing and academic problems that learning disabled students experience during their school years persist into adulthood (Adelman & Vogel, 1991; Gerber & Reiff, 1991; Polloway, Smith & Patton, 1988). And, because learning disabled adults tend to have a more negative self-concept, negative perceptions of self-efficacy, lower perceptions of control, and a long history of failure in educational activities (Adelman & Vogel, 1991; Gerber & Reiff, 1991), these students may be less willing to initiate learning activities. Therefore, these students in particular are likely to benefit from an approach that promotes self-directed learning in pursuit of immediate goals.

It was also hypothesized that the SCL intervention might be suited to providing support in post-secondary contexts. Consider the role of support services in this regard. Students who access services present a variety of difficulties, are enrolled in a range of courses, and need help with an assortment of tasks. Students are immediately concerned with pressing problems. Those who support these students must be maximally effective in a limited amount of time. The SCL model may be helpful in this context because it provides effective, efficient support addressed to individual needs but, at the same time promotes independence, rather than continued reliance on supports.

In this study, students were provided with individualized support in the context of meaningful work. Each adult learner selected a task or problem of immediate importance, and the intervention was provided in that context. However, while tasks and goals selected by students were unique, for each the process of intervention was the same. During each session, students were provided with scaffolded support to regulate their

learning while completing selected tasks. Students were supported to reflect on their learning processes: to define goals, consider and implement approaches, monitor effectiveness, and adapt approaches as required. While at first the instructor provided more input and was more active in soliciting suggestions from students, from the beginning students were responsible for selecting approaches to be tried. Further, at least once per session, students distilled what they had learned about their own cognitive processing, abstracted general principles out of current experiences in their own terms, and defined specific strategies. These strategies then served as the basis for future work and discussion, where they were implemented, evaluated, and further modified.

Based on the characteristics of the SCL approach, it was expected that participants would develop effective task-specific strategies, and that their performance on selected tasks would improve. More importantly, it was also expected that students would transfer strategy use to similar tasks across contexts and over time, and that students would begin to attack other tasks in a problem solving and strategic manner. In other words, it was expected that students would become more independently self-regulating. These expectations led to four specific research questions. As a result of participating in SCL,

1. Do students demonstrate active involvement in the development, use, and modification of strategies during the intervention?
2. Do students transfer strategy use to similar tasks in other contexts and maintain strategy use into the next semester?
3. Does task performance improve on training tasks and on similar tasks completed either in other contexts (transfer) or during the next semester (maintenance)?
4. Do students transfer strategic processing to different tasks and demonstrate improved performance on those tasks?

Improved task performance was expected because, as in other strategy training approaches, students learned task-specific strategies that were designed to improve

performance. It was expected that in this study students would transfer strategy use to similar tasks across contexts and over time for two reasons. First, students were supported to mindfully abstract principles about strategies through experiences with tasks (Salomon & Perkins, 1989; Wong, 1991), which should theoretically lead to decontextualization of principles for use across contexts. Second, transfer has been associated with perceptions of strategy utility and value (Borkowski & Muthukrishna, 1992; Ellis, 1993; Palincsar & Brown, 1984). One reason that students would have perceived their strategies as valuable was that they were helpful in the completion of immediately pressing and important work. By contextualizing instruction in the context of actual work, students are more likely to perceive strategy utility (Ellis, 1993; Palincsar & Brown, 1984). Second, strategies were personalized. They were developed for students based on their current strengths and needs, in response to their unique goals and areas of difficulty. It was expected that students would perceive value in strategies developed specifically for them.

It was also expected that, not only would students employ learned strategies across contexts and over time (research questions 2 and 3), but that students would also become more self-regulating in their learning generally (research questions 1 and 4). Borkowski (1992) has argued that self-regulation is manifested when students either select or adapt strategies in response to task demands. In this study, self-regulation was assessed in two ways. First, it was expected that students would assume a more active role in developing strategies for their chosen task over time (question 1). Second, it was expected that students would be more likely to develop or adapt strategies for use in non-instructed tasks (question 4).

The Interaction Between Knowledge and Strategic Processing

Students' knowledge and beliefs are intimately related to their engagement in self-regulated learning. First, knowledge and beliefs can energize or undermine self-regulation (Borkowski & Muthukrishna, 1992; Paris & Byrnes, 1989; Zimmerman, 1989). Second, knowledge and beliefs are modified as a result of self-regulating

activities (Borkowski & Muthukrishna, 1992; Paris & Byrnes, 1989). For example, looking at self-regulation from a constructivist perspective, Paris and Byrnes (1989) define four theories students construct as a result of learning experiences and which in turn impact on further self-regulation, students' theories about tasks, strategies, the role of effort in learning, and themselves as learners. Based on this interactive model of self-regulation, the goal of strategy instruction can be further specified. The aim is to promote not only engagement in self-regulating activities, but to promote the development of theories (knowledge and beliefs) which support self-regulation.

In this study, engaging students in self-regulation was expected to influence, not only students' cognitive processing during learning, but also their developing knowledge and beliefs. These expectations led to three further research questions. As a result of participating in SCL,

5. Do students demonstrate increased metacognitive awareness about tasks and strategies over the course of the intervention?
6. Do students' perceptions of self-efficacy increase over the course of the intervention?
7. Do students' patterns of causal attributions shift over the course of the intervention?

Specifically, it was expected that by assisting students to clearly define goals, to adopt strategies for achieving goals, and to reflect on their success in doing so, students would be engaged in "Strategic Analysis Activities" (Ellis, 1993) or "Metacognitive Acquisition Procedures" (Borkowski, Estrada, Milstead, & Hale, 1989). Borkowski et al. (1989) have argued that these activities build metacognitive knowledge about strategies. In this study, it was expected that engaging students in reflection not only about cognitive processing, but also about task goals, would promote awareness of both tasks and strategies. This expectation is addressed in question 5.

Motivational beliefs, including perceptions of self-efficacy and attributions, are also critical determinants of the degree to which students self-regulate (Bandura, 1993; Paris & Byrnes, 1989; Zimmerman, 1989). Following Borkowski (Borkowski, 1992; Borkowski & Muthukrishna, 1992), it was expected in this study that students' continuous monitoring of task improvements associated with strategy use would lead to increases in students' sense of control over learning, preferences for their selected tasks, and perceptions of self-efficacy. It was also expected that students would be more likely to attribute success to effort, strategy use, or improved ability, rather than to luck or task ease, and to attribute failure to lack of effort or strategy use, rather than to lack of ability, bad luck, or task difficulty (Borkowski & Muthukrishna, 1992; Borkowski, Weyhing, & Turner, 1986). These expectations are reflected in research questions 6 and 7.

The SCL approach is an extension of previous interventions designed to promote metacognition, self-regulated learning, and independent strategy use (Borkowski, 1992; Englert, 1992; Palincsar & Brown, 1984; Paris & Byrnes, 1989; Paris, Wixson, & Palincsar, 1986; Reeve & Brown, 1985). It is a theoretically based instructional approach founded on an analysis of the relationship between instruction and transfer (Salomon & Perkins, 1989; Wong, 1991) and of the nature of knowledge and knowledge acquisition (Adams, 1990; McClelland & Rumelhart, 1986). The intent was to develop an intervention that would consider both cognitive and motivational variables (Borkowski & Muthukrishna, 1992; Paris & Byrnes, 1989), and would promote in students a disposition to attack tasks in a strategic manner. Based on its theoretical framework, several aspects of the approach have been specifically associated with expected effects. To explore the relative importance of different characteristics of the approach, at least from the participants' points of view, one more research question was posed. This was,

8. What gains do students perceive following the intervention, and how do students account for perceived improvements?

It was hoped that students would provide helpful information for future research about the value of the SCL approach generally and about specific characteristics of the approach that they perceived to be most beneficial.

Summary of Research Questions

1. Do students demonstrate active involvement in the development, use, and modification of strategies during the intervention?
2. Do students transfer strategy use to similar tasks in other contexts and maintain strategy use into the next semester?
3. Does task performance improve on training tasks and on similar tasks completed either in other contexts (transfer) or during the next semester (maintenance)?
4. Do students transfer strategic processing to different tasks and demonstrate improved performance on those tasks?
5. Do students demonstrate increased metacognitive awareness about tasks and strategies over the course of the intervention?
6. Do students' perceptions of self-efficacy increase over the course of the intervention?
7. Do students' patterns of causal attributions shift over the course of the intervention?
8. What gains do students perceive following the intervention, and how do students account for perceived improvements?

II. REVIEW OF LITERATURE

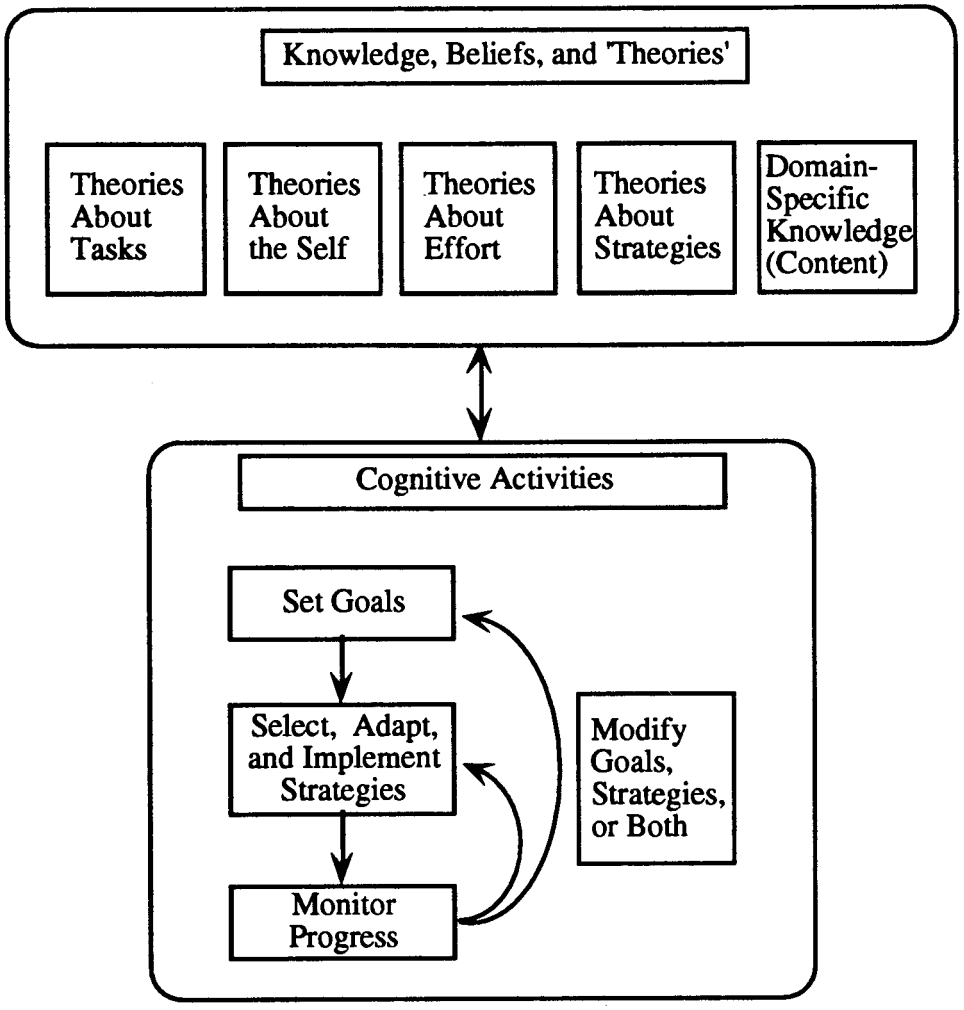
This literature review is formatted in three sections. First, to clarify the Strategic Content Learning (SCL) approach, its origins, and its theoretical base, extant approaches designed to promote the development of self-regulated strategy use are reviewed. Second, the limitations of these approaches are explored, and the SCL alternative is described. Finally, research on adults with learning disabilities is examined, and the particular suitability of the SCL as an intervention for these students is outlined.

Promoting Self-Regulated Strategy Use

A fundamental goal of strategy instruction is to foster the development of self-regulation. The aim is for students to approach tasks in a problem solving manner, and to flexibly select, implement, evaluate, and adapt task-appropriate strategies as required (Borkowski, 1992; Borkowski & Muthukrishna, 1992; Ellis, 1993; Montague, 1993). While this purpose is generally endorsed by cognitive intervention researchers, the best means to this end is disputed (e.g., Pressley et al., 1987). To facilitate comparison of current models of strategy instruction, I begin by analyzing this goal more specifically. To this end, a simplified model of self-regulated learning is presented in Figure 1.

First, models of self-regulation emphasize a series of cognitive activities central to task completion (Carver & Scheier, 1990; Zimmerman, 1989). Self-regulated learners are reflective and planful. They set goals, select strategies for achieving goals, and monitor progress (Zimmerman, 1989). Based on both internal monitoring and the processing of externally provided feedback, learners determine whether progress is satisfactory (Butler, Winne, & McGinn, 1993). If it is, then task engagement is maintained (Carver & Scheier, 1990). On the other hand, when confronted with obstacles, self-regulated learners reevaluate their activities, modifying goals, strategies, or both. This recursive cycle of activities is depicted in Figure 1.

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



Students' knowledge and beliefs are intimately related to this cycle of activities. Knowledge and beliefs can energize or undermine self-regulation (Borkowski & Muthukrishna, 1992; Paris & Byrnes, 1989; Zimmerman, 1989) and at the same time are modified as a result of cognitive activities engaged (Borkowski & Muthukrishna, 1992; Paris & Byrnes, 1989). For example, looking at self-regulation from a constructivist perspective, Paris and Byrnes (1989) define four theories students construct as a result of learning experiences which in turn impact on further self-regulation: students' theories about tasks, strategies, the role of effort in learning, and themselves as learners.

Researchers have also emphasized the relationship between domain-specific knowledge and strategy use (Alexander & Judy, 1988; Perkins & Salomon, 1989). Based on this interactive model of self-regulation, the goal of strategy instruction can be further specified. The aim is to promote not only engagement in self-regulating activities, but also the development of theories (knowledge and beliefs) which support self-regulation.

Consider briefly each of the types of knowledge and beliefs influential in self-regulated learning. First, through experiences with learning activities students develop an understanding about tasks. Winne and Marx (1982) note that students' perceptions of tasks mediate the goals they select and the products they produce, and that these perceptions of tasks don't necessarily match those intended by the teacher. An example is provided by research on students with learning disabilities. Based on experience, these students often focus on mechanical, rather than substantive, aspects of writing tasks (Graham, Schwartz, & MacArthur, 1993). If students perceive writing to be about spelling correctly and using correct grammar, rather than communicating ideas in a coherent way to a specified audience, then the strategies they engage and the products they produce will be driven by that understanding. Generally, students' understandings about tasks both evolve out of learning experiences and affect goals and strategies engaged in further self-regulation.

The critical importance of motivational beliefs has also been emphasized (Borkowski, 1992; Borkowski & Muthukrishna, 1992; Paris & Byrnes, 1989). While several motivational constructs are subsumed in students' "theories about themselves as learners" and about "effort" (Paris & Byrnes, 1989; see Figure 1), two have received a great deal of attention. These are students' perceptions of self-efficacy and their attributional beliefs (Bandura, 1993; Borkowski & Muthukrishna, 1992; Borkowski, Weyhing, & Turner, 1986; Paris & Byrnes, 1989; Zimmerman, 1989). First, consider the importance of student's perceptions of self-efficacy. Self-efficacy beliefs are people's "beliefs about their capabilities to exercise control over their own level of functioning and

over events that affect their lives" (Bandura, 1993, p. 118). Bandura (1993) argues that self-efficacy beliefs influence "how people feel, think, motivate themselves, and behave" (p. 118). In the context of self-regulated learning, self-efficacy influences goals students set, commitment to those goals, and the skills employed to reach those goals (Bandura, 1993; Paris & Byrnes, 1989; Zimmerman, 1989).

Because attributions reflect students' explanations for their success or failure at tasks, they are closely related to perceptions of self-efficacy (Bandura, 1993; Borkowski & Muthukrishna, 1992). When students have higher perceptions of self-efficacy, they may be more likely to attribute their performance to factors within their control (e.g., effort or strategy use). Research has demonstrated that attributional beliefs influence both strategies employed and students' persistence in tasks (Borkowski et al., 1986). Similarly, research suggests that strategy maintenance and transfer are enhanced when students are taught to attribute performance to effort rather than ability (Borkowski et al., 1986).

While perceptions of self-efficacy and attributional beliefs drive self-regulation (Bandura, 1993; Borkowski et al., 1986), at the same time these beliefs evolve out of students' experiences with tasks (Borkowski & Muthukrishna, 1992; Paris & Byrnes, 1989). For example, Borkowski (1992) argues, "as strategic and executive processes become more refined, the young student comes to recognize the importance of being strategic. As a result, feelings of self-efficacy emerge. Simultaneously, children learn to attribute successful academic outcomes to effort (and sometimes ability) rather than to luck or ease of the to-be-learned task" (p. 253). In sum, motivational beliefs, including perceptions of self-efficacy and attributions, both influence the cognitive activities engaged during self-regulation and evolve through engagement in academic tasks.

Another type of knowledge that both influences and is influenced by self-regulation is knowledge about strategies. Descriptions of the important qualities of strategic knowledge vary, but researchers generally agree that students must amass knowledge of

three types: declarative (knowledge about a strategy), procedural (knowledge about how to use a strategy), and conditional (knowledge about strategy utility, and about when and where to use the strategy) (e.g., Ellis, 1993). Both Pressley (1986) and Borkowski and Muthukrishna (1992) also distinguish between specific and general strategy knowledge. Specific strategy knowledge includes not only declarative, procedural, and conditional knowledge about specific strategies, but also knowledge about how to adapt a strategy within different tasks, the ease of strategy use, and episodic information about the situation where the strategy was first learned (Pressley, 1986). General strategy knowledge is "metastrategic knowledge that is abstracted from repeated use of specific strategies guided by specific strategy knowledge" (Pressley, 1986, p. 141). It is knowledge about the general importance and value of attacking tasks strategically. Both general and specific strategy knowledge set boundaries for approaches which can be employed during self-regulation. At the same time, strategy knowledge is constructed through experiences with strategies across a variety of learning contexts.

One last type of knowledge that is pivotal to self-regulation is domain specific knowledge. Based on a comprehensive review of the literature, Alexander and Judy (1988) describe a number of ways in which strategy knowledge and domain specific (content) knowledge are interdependent. For example, not only does efficient use of strategies contribute to the development of content knowledge, but also a solid foundation of knowledge in a domain is prerequisite to the effective use of strategies (Alexander & Judy, 1988). Similarly, Perkins and Salomon (1989) describe the interplay between strategies and domain specific knowledge in task performance. Both are essential to quality performance, and application of one shapes application of the other. For example, rather than being applied in a constant form across domains, strategies (or thinking skills more generally) should act like a hand grasping a variety of objects. They should be molded in form to operate effectively in different tasks or content (Perkins & Salomon, 1989). The interaction of domain specific and strategic knowledge thus impacts on the

course of strategy deployment and self-regulation. Again, however, this influence is not unidirectional. Content and strategic knowledge evolve through engagement in self-regulation.

In sum, self-regulation depends on prior knowledge and beliefs; and it involves setting goals, selecting strategies, monitoring progress, and adapting goals and strategies as required. Borkowski (1992) argues that self-regulation is evidenced when students select or modify strategies in response to task demands, for example when current strategies prove ineffective or when shifting tasks. What guides students through the process of strategy selection and self-regulation? Researchers have identified executive control processes and metacognition as important factors (Wong, 1986). "The term metacognition has been used to refer to both students' knowledge about their own cognitive processes and their ability to control these processes by organizing, monitoring, and modifying them as a function of learning outcomes" (Weinstein & Mayer, 1986, p. 323). Researchers have suggested that students who are taught to monitor and direct their cognitive processing consciously are more likely to regulate their own strategy use in appropriate contexts in the future, thus showing more maintenance and transfer of training (Paris, Wixson, & Palincsar, 1986). While researchers acknowledge that effective strategy use can be automatized (Borkowski & Muthukrishna, 1992), most agree that self-regulated learning is reflective, at least when obstacles are encountered (Carver & Scheier, 1990).

Based on this discussion, the goal of strategy instruction can be more systematically explicated. The ultimate goal is to promote independent and self-regulated learning. To achieve this end, students must learn to adopt task appropriate goals, to generate, select and/or adapt strategies responsively based on tasks and relevant content knowledge, and to monitor progress and adjust approaches as necessary. While automatization of strategy use would reduce the load on cognitive resources, so that attention could be devoted more singularly to knowledge building, students should pause to reflect and problem solve in

the face of perceived obstacles. Finally, self-regulation must be supported by students' knowledge and beliefs. Students must develop knowledge about tasks, strategies, and specific domains, as well as motivational beliefs, including perceptions of self-efficacy and attributional beliefs, which support, not undermine, self-regulation.

Current Instructional Models

A healthy debate wages in the current literature as to the best means to achieve these objectives (e.g., Borkowski, 1992; Borkowski & Muthukrishna, 1992; Ellis, 1993; Englert, 1992; Montague, 1993; Pressley et al., 1987; Wong, 1993). In the discussion which follows, I will compare and contrast three current models of strategy development. These models share the goal of teaching cognitive processes underlying successful performance, rather than focusing on qualities of task products alone (Wong, 1992). Each is informed by research which, based on observations of competent learners or experts, has identified the characteristics of effective processing (e.g., Bereiter & Bird, 1985). The models differ, however, in their conceptions of how best to communicate these processes to students. Two of the models embrace the direct instruction of specific strategies (Borkowski & Muthukrishna, 1992; Ellis, 1993), while the last is based on a sociocultural model (Englert, 1992; Palincsar & Brown, 1984).

Borkowski and Muthukrishna (1992) trace the development of self-regulated learning and outline an instructional approach designed to foster that development. They suggest that the development of self-regulation starts with accumulating specific strategy knowledge about a single strategy. Once students have mastered one strategy, they then learn others, thereby expanding specific strategy knowledge. Given varied experiences with strategy application across tasks, students then begin to engage in the cyclical activities definitive of self-regulation. As a first step, students learn to analyze tasks and select among strategies. Over time, they also learn to monitor strategy effectiveness and adapt strategies if required. This process of selecting, implementing, monitoring, and revising strategies further leads to the development of general strategy knowledge and the

recognition of the importance of approaching tasks in a problem-solving and strategic manner.

At the same time, perceived progress associated with strategy use leads to shifts in self-efficacy and attributional beliefs. Students both develop more positive perceptions of self-efficacy and "learn to attribute outcomes to effort in strategy deployment rather than to luck" (p. 485). The development of more positive motivational beliefs in turn energizes further self-regulation. Emerging self-regulation of strategies also assists students to perform academic tasks more effectively, enabling construction of domain specific knowledge, which itself facilitates further learning attempts. Finally, students' self-theories shift (Paris & Byrnes, 1989). They imagine and strive for "possible selves" (Markus & Nurius, 1986), and these perceptions support establishing goals and persisting in learning to achieve them, thereby sustaining the cycle of self-regulation.

The instructional model described by Borkowski and Muthukrishna (1992) mirrors their description of the development of self-regulation. They argue that knowledge of specific strategies is prerequisite to the development of executive control processes and modification of motivational beliefs. "Not only are specific strategies essential for effective learning and problem solving, they provide the context for presenting higher-level planning and executive skills as well as represent the basis for restructuring attributional beliefs and enhancing self-efficacy" (p. 488). Further, they suggest that as a first step communication of specific strategy knowledge is best achieved through the direct, or explicit, instruction of strategies. They argue that "explicit instruction with feedback during strategy training is superior to asking students to infer or abstract a strategy's characteristics" (p. 489).

In explicit instruction, the effective cognitive processing of competent learners or experts is summarized into a sequence of steps which are then taught directly to students (Ellis, 1993; Pressley et al., 1987; Schumaker & Deshler, 1984). Instruction generally begins by introducing the steps (often with a mnemonic device to help students

remember them), modeling (thinking aloud while applying the strategy within a task), and providing opportunities for guided, then independent, practice. To promote transfer and maintenance, Borkowski and Muthukrishna (1992) argue first, that instruction should be conducted in the context of meaningful work, and second, that practice with strategies should be challenging, extensive, and varied. The outcome of this direct instruction is movement through the first steps in the development of self-regulation, accumulation of specific strategy knowledge about one, and then many strategies.

Borkowski and Muthukrishna (1992) define instructional components essential to further development of self-regulation. In general, while at first the teacher structures instruction, defining the steps in effective cognitive processing and conveying those steps directly to students, over time students assume more responsibility for regulating strategy use and ultimately, for adapting strategies to their needs. Similarly, instructional formats move from teacher-directed instruction of strategies to more collaborative dialogues about strategy use as applied in meaningful tasks. For example, to promote development of metacognition and executive control processes, students are supported to select, implement, and evaluate strategies. Similarly, so that students will personalize and take ownership over strategies, they are encouraged to critique, modify, and even generate strategies in response to different task demands.

A second instructional approach within which the direct instruction of strategies is a pivotal component is the Integrative Strategy Instruction (ISI) model recently proposed by Ellis (1993). ISI is a comprehensive model for integrating strategy and content instruction within regular classrooms. Ellis advocates movement through four general stages of instruction. In an orienting stage, teachers engage students in guided activities (Jones, Palincsar, Ogle, & Carr, 1987) which cue effective cognitive processing in the completion of tasks. Similar to procedural facilitators (Englert, 1992), orienting activities provide students with an experiential base "related to using a specific set of information processes" (Ellis, 1993, p. 368). In the framing stage of instruction, the cognitive

processes students engaged in the orienting stage are "framed" into specific cognitive strategies, which are then taught directly to students. As in Borkowski and Muthukrishna's instructional model, "the strategy instruction that occurs when framing processes are used is explicit and involves describing a strategy, modeling how the strategy is performed, and promoting student elaboration on the strategic processes" (Ellis, 1993, p. 368).

As an example of how orienting and framing activities might be paired, Ellis (1993) describes how an instructor might teach students to use graphic organizers to structure ideas when writing. During the orienting phase, the teacher would employ graphic organizers to present new information, thereby prompting students to use cognitive processes associated with the to-be-instructed strategy. During the framing phase, students would then be taught a systematic routine for using the same graphic organizer to structure their own writing.

In a third phase, instruction moves from explicit presentation of strategy steps to supporting students to apply strategies across contexts. Students implement strategies across multiple contexts in actual content area assignments. Finally, in the extending phase of instruction, the focus is on supporting generalization of strategy use to a variety of problem solving tasks. Students are encouraged to adapt or design strategies, and to "experiment, evaluate, and refine them" (Ellis, 1993, p. 370). It is in this phase that students are encouraged to take ownership over strategies, and that the metacognitive and executive processes associated with self-regulation are fostered. Like Borkowski and Muthukrishna (1992), Ellis (1993) employs interactive dialogues and collaboration between peers to support strategy application in these later stages of strategy learning.

In sum, both Borkowski and Muthukrishna (1992) and Ellis (1993) share a common goal, promoting self-regulation. They share a vision of what a self-regulated learner looks like. Both stress the importance of executive processes, including the selection, implementation, and monitoring of strategies. Both argue that students must ultimately

take ownership over strategies, modifying, personalizing, or even generating strategies to meet their needs. Further, in several critical respects, these researchers share a vision as to how to achieve this end. While Ellis adds an "orienting phase", where students are cued to engage specific cognitive processes in advance of strategy training, both agree that development of self-regulation procedes from initial mastery of specified strategies taught using direct instruction. Only once students have mastered and applied a range of strategies do executive processes develop. In both models, responsibility for directing cognitive processing is initially the teacher's, and is only gradually passed to students as their knowledge about strategies accumulates.

Further, both models describe similar activities in which students should engage in later stages of learning to promote development of executive control processes and metacognition. In both, conscious reflection while trying, comparing, evaluating, and modifying strategies is critical. Ellis calls these "Strategic Analysis Activities" while, in previous work, Borkowski (Borkowski, Estrada, Milstead, & Hale, 1989) referred to similar activities as "Metacognitive Acquisition Procedures" or "MAPS". Both Borkowski and Muthukrishna (1992) and Ellis (1993) argue that these later activities can best be supported through collaborative problem solving and interactive dialogues, either between the instructor and students or between peers.

The third and last class of strategy training approaches to be discussed here are founded on a sociocultural model (Englert, 1992; Palincsar & Brown, 1984). Two prominent and influential examples are Englert's Cognitive Strategies in Writing (CSIW) program and Palinscar and Brown's (1984) reciprocal teaching. Like the models of Ellis (1993) and Borkowski and Muthukrishna (1992), these models seek to teach students effective cognitive processing. They, too, begin with a definition of the steps used by effective learners or experts and attempt to convey those steps to students. Where this last set of models differ, however, is in the method in which those steps are conveyed.

Take as an example Palincsar and Brown's (1984) reciprocal teaching approach. This approach is based on two main tenets. First, following Vygotsky (1978), it is suggested that instruction should be conducted within each student's "zone of proximal development" for a given task. This zone exists where task performance is not yet independent, but can be enhanced with assistance. It is at this stage where development can best be promoted. The second tenet is that movement through the zone can best be effected through interaction with others. Reeve and Brown (1985) suggest that metacognition develops through internalization of principles modeled in such social interaction.

Based on this theoretical framework, Palincsar and Brown (1984) designed a strategy training program to promote reading comprehension. First, they identified four activities which subsume the most important strategies used by competent readers: questioning, clarifying, summarizing, and predicting. As part of the reciprocal teaching approach, these strategies are taught to students. Specifically, students work together with a teacher in small groups on a reading task. Once one or more of the strategies are introduced, the teacher and students take turns acting as instructor and leading the group through use of the strategies while reading short passages. The teacher's role is twofold: first, modeling effective processing when it is her turn to be instructor, and second, providing just enough scaffolded support to help students engage the strategies when it is their turn to lead the discussion.

The direct instruction and sociocultural approaches to strategy instruction differ in several ways. First, advocates of direct instruction assume that students master strategies by learning declarative knowledge about strategies first, and then translating that knowledge into procedures during guided and independent practice. In contrast, both Englert (1992) and Palincsar and Brown (1984) argue that students' thinking is modified when they internalize the cognitive processing evidenced in the dialogue of expert thinkers during the course of social interaction. In this alternative view, the role of the

teacher is to provide a language for discussing thinking, to model for the student more effective cognitive processing, and to guide students to engage similar processes. The students' task is then to internalize that cognitive processing and make it their own. This transition transpires in the context of social interaction.

In both direct instruction and sociocultural models, responsibility for defining effective strategies rests initially with teachers. In both, the teacher explains and models strategy use as a first step in instruction. However, while in direct instruction strategy mastery is prerequisite to application or extending activities, in reciprocal teaching strategies are immediately employed in collaborative problem solving where students discuss, evaluate, and adapt strategies to achieve reading goals (Palincsar & Brown, 1988). Thus, from the beginning, reciprocal teaching engages students in interactive dialogues during which cognitive and metacognitive strategy use is modeled and discussed as a means to promote the internalization of strategy steps and the development of metacognition.

A Re-examination: Strategy Training and Strategic Learning

In each of the strategy training models reviewed, a goal of instruction is to convey to students one or more predefined strategies. At least four problems may arise when strategy training procedes from this basic goal. First, when a strategy for task performance is defined, either by an instructor, a researcher, or based on an analysis of the performance of experts, this routine represents just one potentially effective approach to task completion. As Swanson (1990) notes, there may be other routes to the same goal. Further, that the defined routine may be effective for some individuals is a distinct possibility, but that it is of universal benefit is unlikely. For example, research which involves teaching a single strategy to a whole class has shown that learning of high ability and average students may not improve, and may even be depressed, by the instruction (Graham, 1992; Swanson, 1990; Wong & Jones, 1982). Further, Swanson (1990) reviews evidence suggesting that the strategies employed by average learners or experts

may not be employed in the same way or as effectively by students with learning disabilities. He also argues that "there is no single best strategy for LD students within or across particular domains" (p. 38).

One way to ensure that students are taught strategies that meet their unique needs, and to encourage the transfer of strategy use across tasks, is to teach a variety of strategies or routines. Students would then acquire a bank of strategies from which they could draw, based on the requirements of a given task and their processing styles. It is from this basic premise that strategy curricula have been developed (Ellis, 1993; Schumaker & Deshler, 1984). This reasoning is evident in both Borkowski and Muthukrishna's (1992) and Ellis' (1993) models of strategy instruction. Initially students learn a large number of strategies, then, as a first step in the development of executive control processes, they begin to select among these alternatives in response to task demands. Given this approach, however, students may spend valuable time learning strategies that fail to meet their individual needs. Students may also be overwhelmed by the number of strategies to be learned (Wong, 1993), or attention devoted to amassing specific strategy knowledge may compete for cognitive resources which could be more profitably devoted to content learning. Finally, students may become frustrated or confused when attempting to implement strategies that do not work well for them.

Montague (1993) raised similar concerns in her reaction to Ellis' proposed ISI model. In her discussion she outlined three goals of strategy instruction: "(a) *adaptation of strategies by students to fit their individual styles and approaches to learning*; (b) generalization of strategies across settings, situations, tasks, and conditions; and (c) development of self-regulated learners" (emphasis added, p. 437). While Borkowski and Muthukrishna (1992) acknowledge that individuals should not be taught strategies they find ineffective and that the same strategies should not be taught to all students, and while Ellis (1993) stresses that students must personalize and adapt strategies once they have

been learned, it is not clear how their models can accommodate individual differences (Montague, 1993).

A second problem arises in cases where strategies become the content of instruction. Researchers have stressed the importance of embedding strategy instruction in the context of meaningful work to avoid a disassociation between strategy knowledge and the tasks where strategies are to be applied (Borkowski & Muthukrishna, 1992; Ellis, 1993; Graham, 1992; Palincsar et al., 1987; Reeve & Brown, 1985). Even when taught in context, however, the essential character of a strategy may be undermined if it is treated as an end of instruction rather than as a means to achieve a particular end. When the goal of instruction is to teach the strategy, the instructed routine may become reified or static rather than representing a simplified description of the dynamic process which underlies any task performance. Strategic processing and self-regulated learning generally may be best characterized as flexible and adaptive responding to fluctuating task demands (Zimmerman, 1989).

A third potential problem becomes evident if we consider the process by which students optimally come to an understanding about strategies and strategic learning generally. There is a growing appreciation that when learning concepts students must actively construct understandings for themselves. For example, in the process of reading, students interact with a text in order to build an interpretation of the text's meaning by blending prior knowledge with text information (Dole, Duffy, Roehler, & Pearson, 1991). Strategies, for the most part, are themselves designed to induce students to elaborate and process information actively during the completion of a task. However, an extension of this reasoning has not often been made. It may be important for students to build on prior knowledge in the construction of understandings, not only about concepts, but also about the kinds of strategies they use when completing a task. Can we communicate strategies to students directly as a set of abstracted rules? Or, in line with a

constructivist perspective, should we assist students to abstract from their experiences with strategic processing an understanding of strategies?

To explore this question, consider one model of how it is that students build an understanding of concepts (Adams, 1990; McClelland & Rumelhart, 1986). Adams (1990) suggests that language plays a critical role in the interpretation of experience and the construction of understanding. For example, in learning what is meant by the word "dog", children are exposed to many different types of dogs. It is certainly the case that not all of these dogs are exactly the same size, shape, or color, but the child learns to abstract what is common to these different instances of a category, in order to develop a prototype of what it means to be a dog (Rosch, 1978). The labeling provided by a language serves to communicate a shared interpretation of experience. Further, by pointing out different characteristics of dog, an adult might assist a child to notice discriminating features . Here the adult's explanation serves to help the child interpret experience, and contributes to the way in which the child constructs an understanding of the concept dog.

Here I would like to extend this model in order to examine more complex learning, not about the nature of simple concepts like dog, but about strategies and cognitive processing more generally. Typically, strategies are a translation into language of the steps involved in the cognitive processing associated with successful task performance. Note, however, that just as language cannot adequately describe the complexity of any given dog, or even what is critically central to being a dog, language cannot capture the complexities of cognitive processing. What can be described, rather, is a simplified interpretation of our internal experience; a way of making sense of what we do mentally.

Learning to be strategic, then, may require abstracting an understanding of strategies in the context of varied experiences with cognitive processing while engaged in meaningful work. Both Bereiter (1991) and Adams (1990) have come to a similar conclusion when discussing the learning of concepts. Each suggests that rules provided

to students in the abstract are of limited value in guiding cognitive processing. Thus, an instructor's role in promoting strategic learning may best be to engage students in strategic processing, and then assist students to construct an understanding of that processing for themselves. Approaches that engage students in interactive dialogues about cognitive processing in the context of meaningful tasks are most likely to achieve this aim (Englert, 1992; Palincsar et al., 1987).

Borkowski (Borkowski, 1992; Borkowski & Muthukrishna, 1992) has argued that his model of strategy training is constructivist because students are involved in interactive discussions and collaborative problem solving in the latter stages of strategy training. These activities engage students in guided discovery of the quality of strategies as they are applied across tasks or are generated in response to task demands. Yet, in Borkowski's model, a prerequisite to guided discovery activities is mastery of specific strategies. Two assumptions are common to any approach which begins in this way. One is that an understanding of cognitive processing can be conveyed directly; the other is that students can direct their own processing following steps or rules outlined by others. These assumptions are not consistent with a constructivist perspective. Ellis (1993) tries to circumvent this problem by beginning instruction with orienting activities which provide an experiential base from which students might construct an understanding of cognitive processing. However, orienting activities are followed by framing activities, where the researcher makes sense of processing for students (in the researcher's language) rather than supporting students to construct understandings of the processes they engaged for themselves.

Engaging students in collaborative problem solving and interactive dialogues sets the stage for construction of knowledge. However, contrast for a moment two conceptions of what is involved in that construction. First, like Englert (1992) and Palincsar and Brown (1984), Borkowski and Muthukrishna (1992) suggest that "the ultimate goal of scaffolding is to develop student independence through the gradual

internalization of the processes that are encouraged during scaffolded instruction" (p. 491). In this view, construction of understandings requires: first, that students engage in the processing modeled and described by others; and second, that the student maps the language of the researcher onto the cognitive processes experienced. In contrast, the preceding analysis suggests that students build understandings by: first, accessing current understandings about strategies (prior knowledge); second, engaging in strategic processing; and third, using language to make sense of the complexity of the cognitive processes used. The difference here is in the point of departure. Are the cognitive processes described or modeled by others internalized by students through social interactions? Or are the cognitive processes experienced by students interpreted in interactive dialogues? Can researchers provide an abstracted description of cognitive processing (through language) which students then translate into mental experience? Or do students make sense of processing they engage by abstracting a general description? Whenever a researcher predefines a strategy and then attempts to teach that strategy directly to students, they adopt the former view, as do Borkowski and Ellis.

Consistent with these ideas, Wong (1992) recently offered an analysis of how to improve transfer and maintenance in the instruction of learning strategies which follows on the work of Salomon and his colleagues (Salomon & Perkins, 1989; Salomon & Globerson, 1987). Salomon and Perkins (1989) define two roads to transfer of a learned skill. Of these, "high road transfer" is effected when students mindfully abstract principles about a skill required for task completion. Mindful abstraction involves "volitional metacognitively guided employment of non-automatic controlled processes" (p. 625) which the student employs to abstract principles out of specific instances. These abstracted principles are rerepresentations or rules that subsume particulars; they are decontextualized and therefore more available for transfer across contexts. Thus, Wong suggests that "What appears to be needed is for intervention researchers and teachers to allow LD [learning disabled] students a *pivotal* role in *mindfully discovering* for

themselves where they can apply the learned strategies, and in *actively seeking connections* between prior learning and the new learning task" (emphasis in the original, p. 22). This argument suggests that instruction should require students to mindfully abstract an understanding of the principles underlying the instructed strategies as a means to promote the subsequent conscious self-regulation of strategy use and, thus, maintenance and transfer.

There is one final problem that is likely to arise when teaching specific processing routines as strategies. Consider for a moment who it is that is being strategic in these approaches. In almost all cases it is the teacher who confronts a novel task, analyzes the task and identifies associated goals, considers the types of problems students might encounter, and defines a specific and hopefully effective routine. It is this routine that is then directly conveyed to the students. In this scenario, students are essentially excluded from the problem solving process that is at the heart of strategic and self-regulated learning. The student has not learned to confront a novel task, identify goals, and to brainstorm, try out, and modify a variety of approaches designed to achieve those goals. As a result, students may acquire little understanding about where strategies come from. They may not recognize that they too can generate strategic approaches and thus ultimately control their own learning outcomes.

Strategic Content Learning. An Alternative Approach

SCL represents an extension of the work of individuals who have proposed interventions designed to promote metacognition, self-regulated learning, and independent strategy use (Borkowski, 1992; Englert, 1992; Palinscar & Brown, 1984; Paris & Byrnes, 1989; Paris et al., 1986; Reeve & Brown, 1985) , and of those who have analyzed the relationship between instruction and transfer (Salomon & Perkins, 1989; Wong, 1991). The approach is also founded on an analysis of the nature of knowledge and knowledge acquisition (Adams, 1990; McClelland & Rumelhart, 1986). The intent was to develop an intervention that would consider both cognitive and motivational

variables (Borkowski & Muthukrishna, 1992; Paris & Byrnes, 1989), and would promote in students a disposition to attack tasks in a strategic manner.

SCL represents a shift in focus. Rather than teaching specific strategies as a first stage in strategy instruction, from the outset students are supported in generating strategies designed to achieve specific and personally meaningful goals. Thus, the instructor collaborates with students to define goals based both on the nature of a task and a student's specific problems with that task. Instructors and students together develop approaches to reach those goals. Throughout the intervention interactive discussions focus on clearly articulating task goals, considering and implementing approaches that might lead to successful performance, reflecting on processes tried in task completion, abstracting a general description of approaches tried, evaluating the success of approaches in achieving goals, and modifying approaches to address remaining obstacles.

How does the SCL approach compare to the models of strategy instruction described earlier? First, as in reciprocal teaching, the instructor's role is to provide scaffolded support to students. However, rather than supporting students to learn and implement a specific strategy flexibly, students are supported to attack tasks in a problem solving manner. Second, as in sociocultural models of instruction (Englert, 1992; Palincsar & Brown, 1984) where students are supported to engage in the complexity of tasks from the outset (e.g., writing, reading), in SCL students are supported to engage in the complex and cyclical processes of self-regulation. Both the instructor and student may suggest possible goals, approaches, or modifications while working through a task; students are not left to discover effective processes by themselves. However, from the beginning students are supported to engage executive processes. It is always the student's responsibility to evaluate and select among alternatives.

The SCL approach has many elements in common with other models. First, SCL recognizes the need to outline explicitly strategic activities that support effective performance. However, rather than defining strategies in advance, students abstract

understandings about strategies as they reflect on and monitor the effectiveness of approaches tried. Second, as in the models described earlier, strategy development in SCL is situated in actual task performance to avoid dissociation between strategies and content. Third, in each model the importance of an experiential base related to the application of strategic approaches is emphasized. In SCL, students try different approaches to task completion and these experiences serve as the basis for interactive discussions about characteristics of strategies. Fourth, both Ellis (1993) and Borkowski et al. (1989) link engagement in selecting, monitoring, and modifying strategies with development of executive control processes. In SCL, students are supported to employ these activities from the first intervention session. Finally, as in sociocultural models, SCL instruction provides scaffolded support and engages students in interactive dialogues about strategies while engaged in meaningful tasks.

The SCL approach also differs in significant ways from the models of strategy instruction described earlier. Whereas in other models responsibility for directing cognitive processing is initially the teacher's and is only gradually passed to students as their knowledge about strategies accumulates, in SCL students assume responsibility for strategy development from the outset. Further, in SCL, rather than internalizing the language of more competent learners, students build an understanding of strategies in their own terms. In addition, strategies developed for each student are unique, because they emerge from the interaction between students' prior knowledge about strategies, their particular goals, current performance problems, and processing strengths and preferences. Finally, strategy instruction is efficient. Rather than mastering a strategy curriculum, students learn specific processing routines targeted to their needs. Rather than learning strategies as additional content, strategy development occurs during pursuit of task related goals. Rather than learning a different strategy for each task, students learn to approach tasks generally in a problem solving manner.

How does this alternative approach resolve the problems outlined earlier? First, students develop routines that are effective specifically for them. For example, experienced, high ability learners might modify strategies to fine tune their performance, while learners with more difficulties may develop strategies which build on their unique processing strengths. Students do not spend time learning a bank of static strategies that are not necessarily responsive to their goals or needs. Second, strategies are not separated from content. The focus of instruction remains on assisting students to perform specific tasks effectively, and approaches to task completion are discussed within that context. Further, through interactive dialogues, students are assisted to construct an understanding of their own processing as they try out approaches across related tasks. By developing their own strategies, students also exercise control over their learning. Finally, students are engaged in a problem solving process. The instructional approach emphasizes the flexibility that is a fundamental characteristic of both strategic learning and problem solving.

The Relevance of the Approach for Learning Disabled Adults

As an approach to strategy training, SCL may be particularly beneficial for students with learning disabilities. Research has shown that, in comparison to their peers, learning disabled students are less likely to employ effective strategies for learning or to develop effective strategies for themselves (Wong, 1986; Swanson, 1990). In general, then, SCL may support learning disabled students to become more independent and strategic learners.

More specifically, in early research, learning disabled students were characterized as production deficient or lacking in strategic processing (Swanson, 1990; Torgeson, 1977). The logical outcome was development of interventions designed to fill in processing gaps by teaching specific cognitive routines. However, current research suggests that students with learning disabilities are "actively inefficient" rather than deficient in strategies (Swanson, 1990, p. 51). These students engage strategies while

learning but their strategic processing is less effective than that of their peers. Swanson (1990) argues that the strategic processing of learning disabled students is problematic in several respects. First, these students employ weak, general methods of problem solving, like those used by experts in unfamiliar situations, rather than relatively more powerful task specific strategies (see Perkins & Salomon, 1989). Second, even when learning disabled students master strategies, they are less likely to fine tune them over time so as to make them maximally efficient. Finally, these students seem to have particular difficulty with monitoring, executive control processing, and the regulation or coordination of strategies.

This analysis of the learning inefficiencies suggests ways in which the SCL approach may promote more efficient and strategic learning by students with learning disabilities. First, strategies are constructed, building on students' prior knowledge and experiences; they are not predefined and then taught from scratch. Second, over multiple sessions, students develop powerful, task-specific strategies to supplement general heuristics. Finally, the express goal of SCL is promotion of executive control processes and self-regulation. SCL may also be particularly helpful for students with learning disabilities because strategies are tailored for individuals and should thus be specifically response to their unique learning needs (Montague, 1993; Swanson, 1990).

SCL may also be an important intervention strategy for learning disabled adults specifically. In characterizing adult learning generally, researchers emphasize that adults tend to be self-directing of their learning efforts, most often in response to particular problems or goals (Cross, 1981; Knowles, 1978; Merriam, 1987). For example, Knox (1980) in his proficiency theory, claims that adults typically choose to engage in learning in order to address an immediate problem, and that they are motivated to learn by a perceived discrepancy between current and desired proficiency levels. Adults initiate learning projects (Tough, 1978) in an attempt to reduce these perceived discrepancies.

However, adults with learning disabilities may be less effective at initiating and carrying through with learning projects. Research indicates that the types of processing and academic problems that individuals with learning disabilities experience during their school years continue to pose difficulties in adulthood (Adelman & Vogel, 1991; Gerber & Reiff, 1991; Horn, O'Donnell, & Vitulano, 1983; Polloway, Smith & Patton, 1988). The impact of persistent processing problems may be to increase the gap between desired and actual performance on tasks that the individual is required to perform. At the same time, while this increased discrepancy should prompt learning disabled adults to initiate self-directed learning projects, they may be less effectively self-directing. For example, Caffarella and O'Donnell (1987) found that levels of self-direction in adulthood are related to educational attainment. Yet research indicates that the level of education achieved by learning disabled adults is often less than that of their peers (Barr, 1990; Gerber & Reiff, 1991). Because learning disabled adults tend to have a more negative self-concept, negative perceptions of self-efficacy, lower perceptions of control, and a long history of failure in educational activities (Adelman & Vogel, 1991; Gerber & Reiff, 1991), these students may be less willing to initiate learning activities (Caffarella & O'Donnell, 1987). Therefore because SCL specifically targets as an objective the development of self-regulated or self-directed learning, it may be particularly valuable for adults with learning disabilities.

The need for research into effective interventions for learning disabled adults is clear (Gerber & Reiff, 1991; Vogel & Adelman, 1990). For example, there is an increasing demand for programs designed for learning disabled adults at the post-secondary level (Vogel & Adelman, 1990). But while programs are proliferating, a theoretical base for these programs is lacking (Adelman & Taylor, 1986, Gerber & Reiff, 1991; Vogel & Adelman, 1990). Further, most of the research currently looking at learning disabled adults is devoted to documenting persisting deficits or areas in adult life where learning disabled adults have problems (Adelman & Vogel, 1991; Barr, 1990).

Very little information is available on how to effectively help learning disabled adults function effectively.

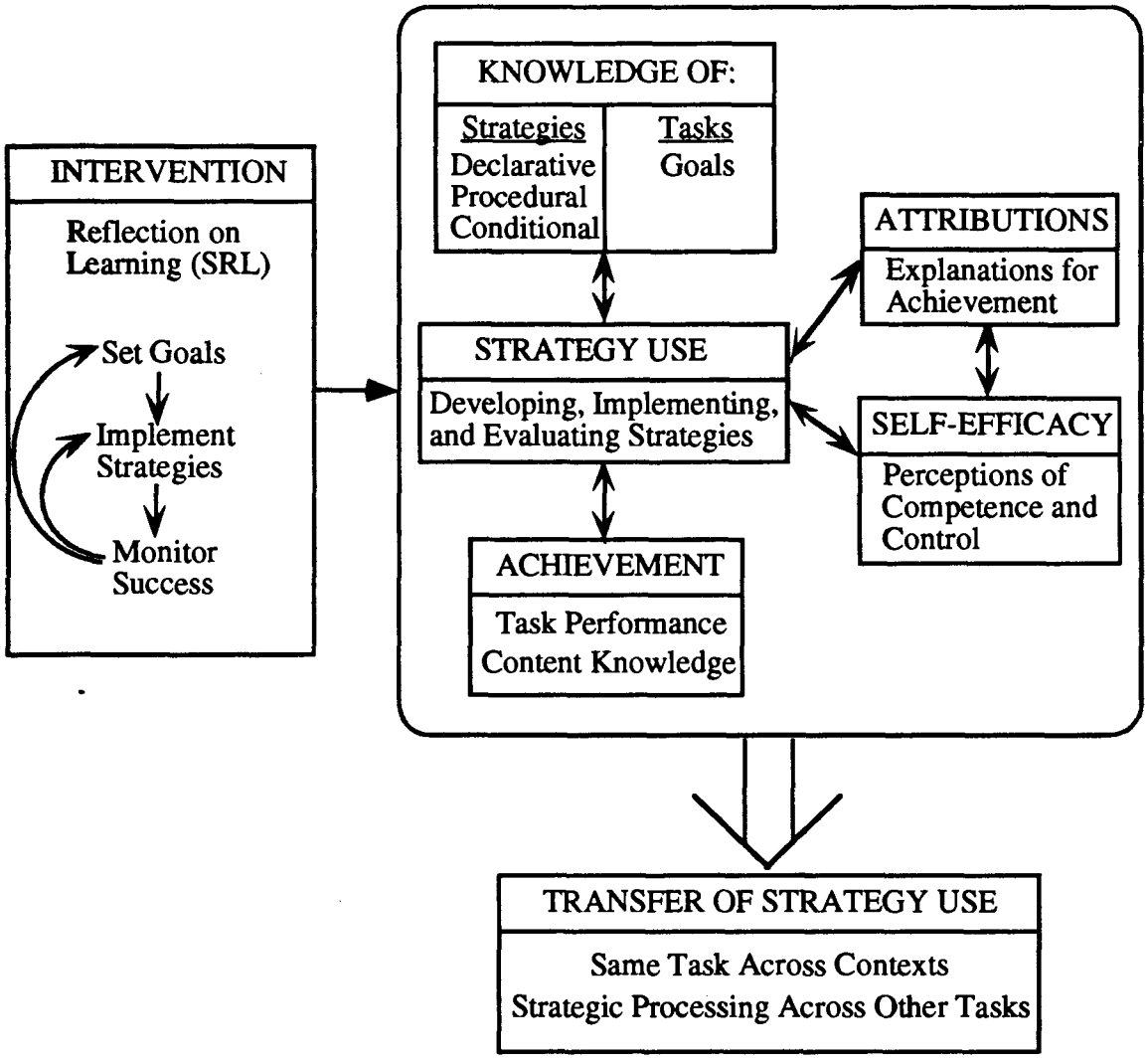
There are at least two notable exceptions to this general trend. First, Hutchinson (1990), recognizing the problems of adults with learning disabilities in establishing careers, is in the process of evaluating a program designed to provide proactive support to learning disabled adolescents in selecting a career direction. In her program Hutchinson employs modeling and interactive dialogues, similar to the approach used in reciprocal teaching. In perhaps the best developed research program for learning disabled adults and adolescents, Schumaker and Deshler (1984) recommend a learning strategies approach. However, while the goals defined by these researchers are similar to those emphasized here (e.g., promoting strategic learning), they favor the direct instruction of a strategies curriculum.

The Current Research

The research reported here represents an evaluation of the effectiveness of SCL as an intervention approach for adults with learning disabilities in post-secondary settings. Each of the six participants was enrolled in a university or college program and chose a task of immediate importance in their current or planned academic work. Consistent with many intervention models designed for adult students, meetings were held with individuals once or twice a week over the course of a single semester. Each session involved: (a) assessing students' current strategies, strengths, and performance levels, and (b) collaborating to develop, implement, and modify strategies while working through meaningful tasks.

Based on the literature review and theoretical analysis in this chapter, it was hypothesized that the SCL approach would promote participants' self-regulated learning, both by supporting independent use of the cognitive activities central to self-regulation and by promoting development of knowledge and beliefs which sustain the process (see Figure 1). Figure 2 graphically depicts the expected effects. First, because students were

Figure 2. Promoting strategic learning: Hypothesized effects



provided with scaffolded support to engage in the cognitive activities central to self-regulation, and because students were involved in the development, monitoring, and modification of strategies during each intervention session, it was expected that they would assume an increasingly active role in the development of strategies over the course of the semester. Second, because students developed strategies in the context of meaningful work, it was expected that students' task performance would improve, and that domain-specific knowledge would therefore increase. A concurrent increase in both knowledge of tasks and strategies was also anticipated.

Next, following Borkowski (Borkowski, 1992; Borkowski & Muthukrishna, 1992), it was expected that students' continuous monitoring of task improvements associated with strategy use would lead to increases in students' sense of control over learning, preferences for their selected tasks, and perceptions of self-efficacy. It was also expected that students would be more likely to attribute success to effort, strategy use, or improved ability, rather than to luck or task ease, and to attribute failure to lack of effort or strategy use, rather than to lack of ability, bad luck, or task difficulty.

Finally, two types of transfer were anticipated. First, it was hypothesized that students would transfer strategy use to similar tasks in non-training contexts (e.g., outside of the intervention sessions) and would maintain strategy use in those tasks over time. Two aspects of the approach were expected to contribute to this effect. One was that students were supported to abstract an understanding of strategies mindfully from experiences with cognitive processing, thereby establishing the conditions for high-road transfer (Salomon & Perkins, 1989; Wong, 1992). It was also thought that students would take more ownership over strategies, in part because the strategies were described in their own words, and in part because the strategies were tailored to their unique strengths and needs. In addition, because strategies were developed as means to solve task related problems, it was anticipated that students would recognize the general role of strategies as means for achieving goals. It was therefore hypothesized that students would demonstrate a second type of transfer, the tendency to generate or adapt strategies for use in non-instructed tasks.

III. METHOD

General

Participants in this research were adults with documented learning disabilities. Each adult learner selected a task or problem of immediate importance, in response to a perceived discrepancy between actual and desired performance levels (Knox, 1980). Although for each student the learning task was unique, for each the process of intervention was the same.

Pilot Studies

The results from two pilot studies are described first. Two students participated in each of the pilot studies. The first pilot study was a preliminary test of the major components of the instructional approach. The second pilot study represented a more formalized implementation and was conducted to set the methodology for the dissertation study.

Pilot Study 1

The first participant in pilot study 1 was a 26 year old woman with learning disabilities taking university transfer courses in psychology at a local college. For this study, the student chose as a task studying textbook content in preparation for the multiple choice exams in her Brain and Behavior course. Figure 3 describes the support provided to this student and illustrates the roles of the instructor and student in the Strategic Content Learning (SCL) approach. First, the student was supported to be flexible in generating strategic approaches given a goal for studying, and was guided to mindfully abstract an understanding about studying in the process of adapting the approach to the demands of course material. Further, during the course of the intervention, the student took ownership of the learning process. After working collaboratively with the instructor to generate strategies for studying just two segments of material, the student independently generated modified versions of the strategy for the rest of the chapter. In college courses prior to the intervention the student received no

Figure 3. An example of the SCL approach from Pilot Study 1.

Case Study 1
LD Adult Studying for College Level Course in Brain and Behavior

Materials: Students' course textbook

Goal: To assist the student to prepare for multiple choice tests on chapter content

Approach: The instructor and student explicitly agreed upon the goal of studying, which was to organize the material in such a way that the student could develop study aids and methods for quizzing herself on chapter content.

In the first section of the chapter, consisting primarily of new terms and definitions, the instructor and student discussed a number of possibilities. The student chose to try an approach that had been suggested by the instructor— developing index cards with terms on one side and information to be remembered on the other. The student implemented the strategy, using the index cards to quiz herself on information. She judged this to be effective strategy in helping her learn the material.

In the second section of the chapter, the student was required to learn the structure of the human eye. The information did not lend itself to the development of single cards. So the student and the instructor worked together to develop an alternative strategy—the student drew a picture of the eye with lines pointing to each structure, then numbered each of the lines. She then filled out index cards with the line number on one side, and the structure name on the other. Her task in studying was to match the name with the structure, then to check herself by cross referencing the line number on the drawing with the number written on the back of the card.

The third section of the chapter required yet another variation on the index card theme. At this point the student took primary responsibility for *generating* an effective strategy for learning the information, given the nature of the materials involved. By the fourth section of the chapter, the instructor made several suggestions for setting up cards which the student rejected in favor of an approach that she felt better reflected the structure of the material in the text. The student independently generated a strategy to flexibly meet the demands of the chapter content.

Success: In previous college level work, including courses in psychology, sociology, and recreation, the student had received an average of a C grade. In this course, the student received A's on all exams, and an A in the course.

better than a C grade. Following instruction the student received A's on all course exams, as well as an A in the course.

The second participant was a first year university student with autism. This student chose as a task studying from his biology and chemistry textbooks. An initial observation of the students' studying revealed that he focused his attention on memorizing isolated

details rather than trying to build a sense of the structure of arguments presented by his course instructor or within his course texts. In this case, the intervention centered on assisting the student to establish more appropriate goals for studying. For example, the instructor and the student examined practice course exams as well as end of chapter questions in order to evaluate the level of understanding required in first year science courses. In addition to reexamining his studying goals, the student and instructor also collaborated to generate a reading strategy. However, rather than learning an explicit strategy for recognizing the relationships of ideas in scientific text (e.g., Cook & Mayer, 1988), the student was engaged in interactive dialogues during which he developed a strategy for relating concepts within and across text segments. After receiving D's on midterm exams in each of his three courses prior to intervention, the student gained a B grade, not only in his biology course, but in his chemistry and math courses as well.

Pilot Study 2

Two students participated in the second pilot, both male. Both students were in their mid 30's and had previously documented learning disabilities. Adam (both names are fictional) chose to work on comprehension of short stories. Paul was preparing to take upgrading courses in preparation for a 2 year vocational program and wanted to improve his ability to take and use notes effectively.

In this second pilot study, the methodology was more formalized. Measures were developed to assess effects associated with the implementation of the approach more systematically. Two questionnaires, assessing metacognitive awareness and perceptions of self-efficacy, were administered prior to and immediately following the intervention. These questionnaires had a common form for each student but referenced each student's chosen task. The self-efficacy questionnaire was comprised of a total of 16 items formatted in two parts. The first part consisted of 10 questions assessing students' perceptions of competence and expectations for success on their chosen task. The second part consisted of 6 questions probing students' preferences for participating in the task.

For all items, students rated how much they agreed with each statement on a scale from 1 (strongly disagree) to 5 (strongly agree). Items were counterbalanced so that positive and negative feelings of self-efficacy were equally represented by ratings at each end of the scale. The metacognitive questionnaire consisted of 10 short answer questions which targeted students' metacognitive awareness concerning chosen tasks and strategies. Students responded in writing and each response was rated on a scale from 1 to 3 in terms of how clearly the student articulated task strategies and goals.

Formal measures of task improvement were also devised. Written records were kept of strategic approaches and modifications. To facilitate analysis of changes in the students' roles in developing strategies and in their understandings about their own cognitive processing, starting half way through the pilot study, each intervention session was tape-recorded and transcribed. At the end of the study, students were asked to reflect on and critique the intervention approach and to describe what they had gained in the process.

Apart from the pre- and posttests, the instructor met with Adam for a total of 15 hours over 8 sessions and with Paul for a total of 16 hours over 10 sessions. Sessions were scheduled roughly once per week at a time of mutual convenience. Highlights of the results from the two cases studies are presented below.

Strategy Development

At pretest meetings and subsequently within each session, task related goals were reviewed and problem areas were targeted for improvement. The instructor then collaborated with each student to develop and modify strategies to achieve their learning goals. For example, in trying to understand stories, Adam had difficulty identifying significant details, following the plot, keeping track of the time in the story, recognizing the perspectives of different characters and the point of view from which the story was told, and identifying the story's theme. Over sessions a strategy evolved which addressed these problem areas. Adam decided first to read the entire story to get a sense of the gist,

paying particular attention to the first few pages which set up the story's characters and setting. He then reread the story, making a note of any unclear points or "puzzles". He also searched for "clues" in the story in order to figure out the "puzzling" aspects and to clarify the characters' perspectives, the plot, and the theme.

In evaluating Paul's note taking, it was clear that he was understanding lecture material well and recording relatively accurate notes but that, one week later, his interpretation of his notes and his reconstruction of the original lecture information were problematic. The intervention focused on assisting Paul to develop a two-part strategy. The first part focused on fine tuning the quality of his lecture notes, building on what he was already doing effectively. Elements of his strategy added during the intervention included linking examples with general points, listening for and recording relational comments (between ideas) in the lecture, and structuring his notes into main points and subpoints. The second part of his strategy helped Paul to retrieve lecture information more effectively from the notes he was taking. Immediately following the lecture, Paul reviewed his notes and filled in any missing information that he could remember, elaborated ideas that were sketchy in his notes, corrected spelling and legibility problems, especially if they involved new terms, and noted comprehension problems in the margin for future reference.

Task Performance

At each meeting, Adam completed a set of questions designed to assess his understanding of the plot, characters, and theme of a different story. Each week his responses were scored, and then summed to give a total per story score (max. 30). Scores from the first two stories and last two stories were averaged to serve as a pre- and posttest measure of story comprehension. Adam's average score increased from 17/30 (63%) to 27.5/30 (92%) over the course of the intervention. Each of the stories Adam read was also rated in terms of its difficulty (on a scale from 1-3) on three dimensions: the amount of dialogue, the complexity of the plot, and the depth and transparency of the theme. The

two pretest stories received an average rating of 1.5 on each of these dimensions, while the average rating of the two post-test stories were 1.5, 2.5, and 3.0 on these dimensions respectively. Thus not only did Adam's comprehension improve, but it did so on stories that were more difficult.

Because Paul's goal was to study from his lecture notes, the amount of original lecture material he could reconstruct from his notes was assessed. To this end, one week following each class, Paul was asked to verbally summarize his class notes. Accuracy of reconstruction was then measured by calculating the percentage of idea units which Paul accurately explained (as judged by a comparison to the information actually presented in the lecture). Within the first 3 sessions, Paul's reconstruction improved from 59% to 88%.

Strategy Use Across Tasks

In pilot study 1, one might infer that both students were strategic in their study of materials not directly used in the intervention. This is suggested by their improved grades across exams (student 1) and in courses other than the one that was the focus of the intervention (student 2). In pilot study 2, it was not possible to observe this potential effect, as the students were not engaged in other courses. However, they did provide evidence that such transfer might occur. As is documented in the transcripts of their interventions, both students spontaneously discussed how they might use their approach in other contexts. For example, Paul discussed how he would use his note-taking strategies when he begins his full-time vocational program, and Adam thought he should take a literature course where he could practice his strategies.

Self-Efficacy

For both Adam and Paul an average rating across 16 items of a self-efficacy questionnaire (max.= 5) was computed from pre- and posttests. Adam's average rating increased from 2.33 to 2.83 and Paul's ratings increased from 2.16 to 3.22. This suggests that students' perceptions of their abilities on chosen tasks improved. Further, on the

metacognitive questionnaire, students complete a single rating scale where they are asked to indicate how good they are at their task. Both students rated themselves as "below average" prior to the intervention, and as "average" on posttests. Considering that these are adults with a long history of academic difficulty, this change associated with a relatively short intervention is encouraging.

Metacognitive Awareness

For both Paul and Adam, an average score was computed across the 10 items on the metacognitive questionnaire (max.= 3) from both pre and posttests. Paul's average score increased from 2 to 3. In contrast, Adam was quite reflective about his own learning prior to the intervention; all items were at the ceiling (3) at both testing times. However, while his scores remained stable, Adam's ability to articulate specific strategies for improving his comprehension and his confidence both improved. Figure 4 presents Adam's pre and posttest answers to one question and illustrates these qualitative improvements.

Perceptions of the Approach

This pilot study provided preliminary evidence of the mechanisms behind the effectiveness of the SCL approach. Specifically, there is qualitative evidence that SCL's effectiveness may be related to students' opportunities to come to an understanding about strategies by reflecting on their cognitive processing while engaged in meaningful tasks. For example, in his final interview, Adam (A) explained that he had taken many study skills courses prior to our working together. However, while he had learned about many strategies, he just couldn't see how they worked when reading stories:

R: Do you think you gained anything that you'll take away even when we stop discussing stories?

Figure 4. Adam's responses to one questions from the metacognitive questionnaire.

Adam's Responses to Question #4

Question: Is reading a hard thing for you to do?

Pretest	1) length of story holds back my comprehension 2) Hard to focus for extended period of time 3) If I do not get the initial plot I end up reading without understanding 4) The story may be very long with very little gist to it
Posttest	It takes a while to get going and getting the time frame and setting in proper perspective. But once these are established I am more confident and the story comes to life.

A: Oh yah, I'll be, I'm more aware of strategies. Like, I'd heard some of the strategies before, like, because I did like reading and study skills, that course? But now I got to, we didn't practice it, we just sort of learned them? You know, the, but this time I learned to apply them a bit more. So the application, yah, I can remember in the application, you know, put them to use.

A bit later Adam continued:

A: I know now, like, I've applied some stories, and I've applied the strategies, and not that I know them, know them separate from the stories, but I can you know, bring them into the story

R: And you know your goals are to clarify time, characters, relationships, that, perspectives, all that stuff, right?

A: Yah, they have no meaning by themselves

R: Yah

A: They only have a meaning in relation to the story

These excerpts illustrate that, for Adam, what he needed to understand strategies was to work with someone in reading a series of stories and reflect on the process of understanding within each.

Students also suggested that the strategies developed were helpful because they were encouraged to take control of their learning, building on their strengths when developing an effective approach that made sense to them. For example, Paul's (P) perceptions of the intervention were as follows:

P: Um, you put it in such a way that it made it my, my work. You helped in putting the words down for me, but the decisions, for the most part were mine, in how the process was being put down on paper and what was being put down, to say what was going to be helpful for me, and they're using my thoughts, but helping your words make it more clear. You're clarifying what I was saying, in a way that made it when I read it, something, something that meant something.

Dissertation Research

Design of the Study

The dissertation study can be best characterized as a mixed design. On one hand, it is comprised of 6 parallel in-depth case studies. At the same time, the study employs a pre-post single group design to test for common effects across participants. This combination allows for collection of qualitative and quantitative data relevant to the effectiveness of the SCL approach. A pre-post comparison allows for analysis of changes over time concurrent with the intervention; tracing the process of intervention for each individual augments the single group design with intensive evidence linking the intervention more specifically with effects.

The overall design is depicted in Figure 5. All participants were pre- and posttested with parallel measures to assess changes in strategy use, task achievement, perceptions of

Figure 5. The study design.

	Initial Meeting	**Pre-testing**	**Intervention Phase**	**Post-testing**	**Transfer & Maintenance**
Time Frame	Approx. 2 wks in advance of intervention	Approx. 1 wk in advance of intervention	Variable number of sessions, 1-2 times per week, through the course of one semester	1 week following intervention	Following semester (as available)
Purpose	Task Selection	Attribution/ Strategy Interview Attribution Questionnaire Metacognitive Questionnaire Self-Efficacy Questionnaire On-line assessment of strategy use Task achievement	Assessment of task performance Assessment of strategy development, use and modifications Records of implementation of the SCL approach	Attribution/ Strategy Interview Attribution Questionnaire Metacognitive Questionnaire Self-Efficacy Questionnaire On-line assessment of strategy use Task achievement Final Interview	Assessment of task performance Assessment of strategy development, use and modifications

self-efficacy, metacognitive awareness, and attributions for task performance. During the intervention phase, each student met individually with the researcher 1-2 times a week within a single semester. Each of the six participants chose a unique task of importance to him or her in their current educational program, and the intervention was provided in the context of that chosen task. Task performance and students' roles in developing, selecting, and modifying strategies appropriate to tasks were monitored throughout the intervention phase. Finally, where possible, measures of strategy use and task achievement were collected in the following semester.

Participants

All participants were adults with previously documented learning disabilities. For the purposes of this research, an adult was defined as an individual 18 years or older who

had left the K-12 school system. Participants were recruited by advertising the availability of academic support for students with learning disabilities at several post-secondary institutions in the greater Vancouver region in British Columbia and at the annual general meeting of the local Association for Adults with Learning Disabilities. Consequently, there were six respondents. Specifically, five females and one male agreed to participate in the study. Students ranged in age from 18 to 36 years. Each was enrolled in a vocational or educational program at one of three post-secondary institutions: three at Simon Fraser University, and three at local community colleges. Each of the students is described briefly below.

Jennifer (18 years old) was entering her first semester of university level work at Simon Fraser University (S.F.U.), having just graduated from high school. She was enrolled in four first year level courses: one in economics, one in geography, and two in psychology. She had debated about whether to attend university, as opposed to college, because she felt her essay writing skills were so weak. She chose to work on essay writing during the intervention.

Joanne (19 years old) was in her second year in a Legal Secretary training program at a local college. She held a position as a legal secretary and her goal was to upgrade her skills. However, she had twice failed the training program's business writing course. She chose to work on her business letter writing not only so that she could pass the writing course, but also to improve her letter writing on the job.

Nancy (28 years old) had been employed as a bank teller but was dissatisfied with the work and was in the midst of a change in career direction. At the time of intervention she was in her second semester in an intensive Early Childhood Education Program (E.C.E.) at a local college. She chose to work on her writing skills in the context of her E.C.E program.

Mike (24 years old) was taking academic upgrading courses in English and math at a local college in order to obtain his high school diploma. Although many of his friends

attended college or university, Mike was unsure whether further post secondary education was an option for him. Therefore, rather than working directly on his English or math in this study, he decided to assess his potential for success at college level work. As his long term goal was counseling, he thought one of the first courses he would take if he were to go to college would be in psychology. The task he chose was to read and study from an introductory psychology text in preparation for college level exams.

Linda (25 years old) had moved from England to pursue graduate studies in kinesiology at S.F.U. She was at the point in her program where she had to pass a statistics course in order to continue her degree but reported consistent difficulties with math in her previous education. Therefore, her goal was to learn how to master statistics and to solve math problems more effectively.

Finally, Kathy (36 years old) had taken university level business courses when she was younger. However, she suffered a brain injury (a tumor was removed from the left hemisphere) which left her with specific learning disabilities. At the time of the study she was for the first time trying to reenter university level work at S.F.U. She was very anxious about the extent of her injury and the degree to which it would impair her learning. She chose to receive assistance on reading and studying from the textbooks for her first year social psychology course.

Because of the differing backgrounds of the participants, the sources of assessment data varied. In general, students were identified as learning disabled based on a discrepancy between potential, as reflected in standardized measures of intelligence, and achievement. While each student had previously taken intelligence tests which confirmed at least average intelligence, specific results were available from only 4 of the 6 students. Assessment data for these students will be described first.

First, Linda had scored in the above average range on the WISC as a child and scored at the "border line average high-average level of intellectual ability" on the WAIS in 1984. In terms of specific areas of difficulty, on the WAIS Linda "achieved

exceptionally low scores on the arithmetic and digit span tests". Her assessment also describes persistent difficulties with literacy skills, particularly spelling. Second, on the WISC-R Jennifer scores were 109 on the verbal, 138 on the performance, and 126 on the full scale IQ. Her assessment describes a general lag in verbal areas given her "superior" potential including specific difficulties with reading, awareness of phonics, and spelling. More recent data on the manifestation of Jennifer's learning disability in adulthood were not available.

Third, Joanne was assessed in 1980, 1983, 1991, and 1992. In 1983, Joanne's scores on the WISC-R were 94, 101, and 96 for the verbal, performance, and full scale IQ's respectively. The Woodcock-Johnson Achievement battery suggested that in reading and math Joanne was "severely disabled" and that in written language she was "moderately disabled". Her most recent assessments revealed persistent difficulties in the areas of math, written expression, and spelling. Finally, Kathy's tests were completed by her neurologist in 1992. On the WAIS-R, Kathy's score was "within the average range as compared to the U.S. normative sample". Specific areas of difficulty included memory problems, especially in the verbal domain. These problems could be directly associated with damage to her left hemisphere.

For the two remaining students, assessments during childhood had revealed at least average intellectual functioning. Further, immediately prior to participating in this study, both Nancy and Mike were comprehensively assessed by a learning diagnostician at the local college where they attended class. During this assessment intelligence testing was not repeated and specific scores were therefore not described. Instead, reports focused on students' problem areas. Nancy's assessment revealed specific difficulties with the recall of verbal information, her knowledge of language, silent reading, and writing, particularly with organization and spelling. Similarly, Mike demonstrated problems with attending to verbal discussions, recalling verbally presented information, his knowledge of language, reading comprehension, and writing, particularly with mechanics and spelling.

Table 1. WAIS-R scaled scores for each student.

Student	Digit Span	Vocabulary	Block Design
Jennifer	8	10	16
Joanne	5	8	9
Mike	6	7	11
Kathy	7	8	8
Nancy	9	8	4
Linda	6	10	13
Mean	6.8	8.5	10.2

Given the variation in students' assessment reports and the unavailability of specific IQ data for two students, it was decided to collect a limited amount of standardized information for each student. To this end, students were individually administered three subtests of the Revised Weschler Adult Intelligence Scale by a qualified psychologist. These were the vocabulary, block design, and digit span tests. The vocabulary and block design subscales were selected as rough measures of students' total verbal and performance IQ's respectively. Wechsler (1981) reports that these two subtests correlate most highly with their respective total scores. Specifically, in a sample of adults between the ages of 25 and 34, the vocabulary subtest correlated .85 with the total verbal score while the block design subtest correlated .67 with the total performance score (Wechsler, 1981). The digit span scale was also included to provide a measure of students' memory difficulties. Students' scaled scores, as well as the mean score for each test, are presented in Table 1.

As described in the WAIS-R manual (Wechsler, 1981), raw scores for each subtest are scaled to have a mean of 10 and a standard deviation of 3. Table 1 indicates that all

students scored within one standard deviation of the mean on the vocabulary test, reflecting roughly average verbal IQs. There was a great deal of interindividual variability in scores on the block design subtest. Specifically, Jennifer scored two standard deviations above the mean and four students scored within average range, indicating at least average performance IQ's for each of these students. Nancy, on the other hand, completed each figure quite slowly and scoring 2 standard deviations below the mean. In contrast, Nancy did relatively better on the digit span test on which three other students demonstrated below average performance, a reflection of their memory difficulties.

Finally, Wechsler (1991) defines the extent to which scaled scores must differ to be statistically different at the 85% confidence level. These differences are 1.67 between vocabulary and block design, 2.31 between block design and digit span, and 1.96 between vocabulary and digit span tests. Given these criteria, it is clear that for every student but Kathy significant within individual variation existed in performance across the three administered tests.

Materials

Consent Form

In an introductory meeting, the researcher met individually with each participant to describe the study. The researcher stressed that participation was completely voluntary and that participants could withdraw from the study at any time. At this meeting, students who agreed to participate signed a consent form (see Appendix 1) and received a copy for their records. This consent form provided students with a written description of the study and also stressed the voluntary nature of participation.

Attribution and Strategy Interview

This short interview consisted of three orally presented questions designed to assess causal attributions and reported strategy use. The questions asked of each student were parallel but referenced a student's chosen task. The first two questions were open-ended

probes of students' explanations for previous achievement outcomes. Specifically, students were asked to think first about a time when they had done well at their task and, second, about a time when they hadn't done as well. In each case they were asked to describe the factors they thought were responsible for performance. If students described what it means to perform well or not well (e.g., features of a good essay) rather than factors responsible for performance, they were further prompted to explain what led them to produce a good (or not good) product in that case. These attribution questions were asked to provide students with an unstructured opportunity to explain factors they perceived to be responsible for performance outcomes.

The third question in the interview was similar in format to interview questions employed previously to assess self-regulation and strategy use (Zimmerman & Martinez-Pons, 1988). Students were asked to describe orally any approach they currently used to complete their chosen task. A copy of the essay writing version of the attribution/strategy interview protocol is provided in Appendix 1.

Attribution Questionnaire

This written questionnaire was a structured assessment of students' causal attributions for task performance. Students were asked to think of a time when they performed their chosen task well (in question 1) or not very well (in question 2) and to rate how much each of 10 factors was responsible for their performance in each case. Ratings were on a scale from 1 ("not a reason that I did well") to 5 ("a major reason that I did well"). The factors included 6 internal (ability, effort, strategy use, mood, interest in the task, motivation) and 4 external (help from others, luck, task ease, conditions in the environment) explanations identified as important in previous research (Relich, Debus, & Walker, 1986; Schunk & Rice, 1986; Weiner, 1974). Questions asked of each student were again parallel, but referenced a student's chosen task. A copy of the essay writing version of the attribution questionnaire is provided in Appendix 1.

Metacognitive Questionnaire

The metacognitive questionnaire employed in this study was adapted from previous strategy training research (Wong, Wong, & Blenkinsop, 1989). Again, each student was asked parallel questions which referenced his or her chosen task. While the complete questionnaire, including 10 short answer questions and one rating scale, was employed in pilot study 2, in this study only 6 questions were used in analyses. Consistent with previous research (Wong et al., in press), these questions were isolated for two reasons. First, they elicit the most focused answers from students. Second, they most pointedly query students' metacognitive understanding of tasks and strategies . In contrast, although the remaining questions (2 to 5) engage students in active thinking about tasks, they target task preference and perceptions of self-efficacy rather than task or strategy knowledge. Further, these questions are more open to interpretation, and responses have proven to be the most difficult to code reliably.

The six questions used for analysis in this study were questions 1 and 6 to 10. These were (from the essay writing version): "What is writing about?"; "What things does a person have to LEARN to be a good essay writer?"; "Why do you think some people have trouble in writing essays?"; "What things do you need to learn to be a better writer than you are right now?"; "What goes on in your head when you write?"; and "How do you write?". In answering these questions students described in writing their perceptions of a task and of the strategies required to perform the task successfully.

One of the excluded questions assessed students' perceptions of self-efficacy, hence responses to this question (#5) were also analyzed. Specifically, as part of this question students appraised whether they were very below average, below average, average, above average, or very above average in ability on their chosen task. These appraisals were translated into numerical ratings ranging from 1 (very below average) to 5 (very above average) for analysis. A complete list of all 10 questions in the essay writing version of the metacognitive questionnaire is provided as an example in Appendix 1.

Self-efficacy Measure

The self-efficacy questionnaire employed in this study was also drawn from previous research (Graham, Scwartz, & MacArthur, 1993; Wong et al., 1989). Again, the questions asked were parallel, but referenced each student's chosen task. The questionnaire was comprised of a total of 16 items formatted in two parts. The first part consisted of 10 questions assessing students' perceptions of competence and expectations for success on their chosen task. The second part consisted of 6 questions probing students' preferences for participating in the task. For all items, students rated how much they agreed with each statement on a scale from 1 (strongly disagree) to 5 (strongly agree). Items were counterbalanced so that positive and negative feelings of self-efficacy were equally represented by ratings at each end of the scale.

For example, two of the items from the first part of the essay writing version were: "When writing a paper, it is easy for me to get ideas"; and "When writing a paper, it is hard for me to organize my ideas". Jennifer was asked to rate her agreement (disagreement) with each of these statements as a measure of perceived competence. Two of the items from the second part of the questionnaire were: "I like to write"; and "I do writing on my own outside of school". These items assessed Jennifer's preferences for engaging in writing tasks. A complete list of all 16 items from the essay writing version of the self-efficacy questionnaire is provided as an example in Appendix 1.

Meeting Record Form

During each meeting the researcher recorded field notes describing the intervention session using a standard form (see Appendix 1). This form cued the researcher to provide a brief overview of the session and to describe the specific task being worked on, any strategies developed, implemented, or modified, and any comments made by students related to self-efficacy or attributions.

Training Materials

During the intervention period, the training materials used with each student were specific to their chosen task and, wherever possible, were drawn from the student's actual coursework. An overview of the six participants, their selected tasks, the materials used during training, and the source of achievement data is presented in Table 2.

During training, Jennifer prepared an oral report for her economics course and wrote two different papers, one for an introductory psychology course and one for a first year geography course. Because Joanne was only given letter writing assignments late in the semester, it was not possible to work on her actual assignments during training. Instead, she wrote letters based on practice exercises in her course text. Nancy worked on one observation assignment and one essay, both part of her E.C.E. course requirements. Linda brought in her statistics course notes which served as material for learning how to develop math concepts. She also brought in copies of sample exams and past quizzes for practice problems. For two intervention meetings, the researcher developed practice problems based on class notes, assignments, and quiz questions. Kathy, who was enrolled in a first year social psychology course, had two course textbooks. During training, intervention focused on helping to improve her reading comprehension on current reading assignments. Finally, Mike collaborated with the researcher to select an introductory psychology text used at a local college. Mike worked on his reading comprehension using passages drawn from this text.

Final Interview

As part of the posttest session, students were interviewed to assess their perceptions of the research study and of progress they had made. In this interview (see Appendix 1), the researcher asked each student four standard questions. These were: "How would you describe what you have gained by participating in this study?"; "Have you achieved the goals you wanted to achieve during the study?"; "How would you describe the process

Table 2. Participants, selected tasks, training materials, and source of achievement data.

Participant[1]	Selected Task	Training Materials	Source of Achievement Data
Jennifer	Writing essays for first year university courses.	Course writing assignments: an economics oral report, a psychology paper, and a geography paper.	Essay exams and papers across four courses (economics, psychology 102, psychology 100, and geography). Essays written for an English course during the following semester.
Joanne	Writing business letters for a legal secretary course and for her position as a legal secretary.	Letter assignments drawn from her course text which were not actual assignments at the time (letters #1 and #2).	Letters written during intervention sessions and during in-class exams.
Nancy	Writing assignments and papers within an Early Childhood Education (ECE) program.	Two assignments (#1 and #6) due in her ECE courses.	Assignments and papers written for ECE courses.
Linda	Learning statistics and solving math problems as part of a graduate level course in statistics.	Class notes from her statistics course. Practice questions derived from quizzes 1-3 (after Linda completed those quizzes in class).	Tests and assignments from her statistics course (along with comparison data of achievement by her classmates).
Kathy	Reading textbooks for a first year psychology course.	Course reading material– the textbook and a book with collected articles.	Oral and written summaries of course readings.
Mike	Reading textbooks, not for an actual course, but to see if he could achieve in a first year college or University level psychology course.	A textbook from a first year psychology course (in which he was not enrolled).	Researcher designed quizzes on textbook content.

[1] Note: All names are fictional

we went through?"; and "If I were to work with another student in the future, what would you recommend that I do again, and what would you recommend that I do differently?". The researcher also repeated back to the student what she had understood from their answers, and asked students to verify her understanding.

Procedure

General Overview

The researcher, who served as the instructor, met with each student individually throughout the study. At an introductory meeting, the researcher described the study and obtained the student's consent to participate. Student background information was gathered, including evidence of a documented learning disability. Students were then asked to select a single task of immediate importance in their current academic work. If a student was undecided, the researcher supported the student to select a task by assisting the student to identify and evaluate alternatives. After choosing a specific task, students were asked to describe task related goals and areas of current difficulty. Based on students' perceptions, the researcher and student established initial objectives to be pursued during the intervention.

Approximately one week later, each student participated in a first assessment session. At this time, the student orally responded to questions in the attribution/strategy interview. Students then responded in writing to the attribution questionnaire. After completing this questionnaire, students were asked to explain their responses orally as a check of their understanding of the questions and each of the possible attributions. Next, students responded in writing to both the metacognitive and self-efficacy questionnaires, in that order. The last step in the initial assessment was to measure students' pretest task achievement and actual strategy use. For this assessment, students were engaged in their chosen task and students' approaches to task completion were observed. The researcher's perceptions of student's initial strategies (e.g., any activities engaged with the aim of completing the task) were systematically described on meeting record forms (see Appendix 6). All oral responses to pretest assessments were tape-recorded and transcribed.

Generally, completion of all pretest interviews and questionnaires took between 30 and 45 minutes. The exception was Kathy, who required nearly 2 hours to complete the

pretest questionnaires. She was highly anxious when answering the questions and reported that it was upsetting to think about the quality of her current performance on tasks compared to what she could achieve before her injury. As a result, for this student pretests were distributed over two subsequent sessions.

The intervention period began approximately one week after pretests and continued through the course of one semester. The researcher met individually with students once or twice per week for 1 to 2 hours at each session. Meeting times and lengths were based on the immediacy of students' assignments and needs. The total number of meetings ranged from 8 to 15, and the time spent with students ranged from 660 minutes (11 hrs) to 1705 minutes (28 hrs) (M= 17.25 hrs, 11.67 sessions). The number and length of meetings on average and for each student individually are summarized in Table 3.

At each session, specific objectives were reviewed in light of current progress. Based on these objectives and the nature of the task, the student and researcher collaborated to develop approaches to task completion (strategies) that would achieve those objectives. The nature of this collaboration is described more specifically in the next section. The student then implemented those approaches in the context of task performance. The researcher and student discussed the strategy's helpfulness and how to modify the approach if necessary. During this process, student-researcher interaction was tape-recorded and all strategy development, use, or modification was described on meeting record forms. In general, whenever a strategy was developed or modified, the researcher and student jointly developed or updated a "strategy sheet" which detailed the features of current strategies. The approaches defined on strategy sheets then served as the basis for trying and modifying strategies during task performance and during the next intervention session.

At the end of the first semester, students participated in a final, posttest session. First, each student orally answered the attribution/strategy interview questions. Next students responded in writing to the attribution questionnaire and explained their answers

Table 3. Intervention duration and number of sessions for each student.

	Jennifer	Joanne	Nancy	Linda	Kathy	Mike	Average
Number of sessions	14	8	10	15	12	11	11.67
Total time (mins)	1155	660	855	1705	1165	660	1033

orally. They then completed the metacognitive and self-efficacy questionnaires. Finally, students responded orally to the questions on the final interview. All oral responses were tape-recorded and transcribed. Posttest sessions generally lasted between 45 minutes and 1-1/2 hours, with the exception of Kathy, whose session lasted for 2-1/2 hours.

It was only possible to track Kathy, Nancy, and Jennifer into a subsequent semester. Where available, evidence of strategy maintenance and task performance was collected for these three students. Of the remaining students, Mike moved out of the area, Linda didn't need to complete any more math courses or work, and Joanne took a break from school.

Specific Description of the Intervention Approach

In this section a general framework for providing instruction following the SCL approach will be defined. However, it should be remembered that instruction was not scripted or prescribed in advance. Judgment of when and how to provide support was contextually determined, based on student need. What is most critical is that the nature of support remained congruent with the principles underlying the SCL approach (Blumenfeld, Krajcik, Marx, & Soloway, in press).

To begin, I will describe more specifically the instructional approach and the nature of student-teacher collaboration. A first characteristic of the SCL approach is that students choose the assignments they want to work on, based on immediate needs. Intervention then centers on helping students to complete chosen tasks in a problem

solving and strategic manner. To this end, during each session the teacher supports students' engagement in the cognitive activities central to self-regulation: defining goals, evaluating and selecting among approaches, implementing strategies, monitoring progress, and modifying strategies as appropriate. Specific strategies are then developed over time, as students implement, evaluate, and refine approaches across similar tasks. When supporting self-regulation, the assistance provided is scaffolded; the amount of support supplied depends on student need and is faded as students become more independently self-regulating.

A second characteristic of the SCL approach is that, to promote independent problem solving in pursuit of objectives, students are encouraged to think through problems rather than being told what to do; the teacher guides students to find answers rather than answering questions for them (Meyer, 1986). For example, when Jennifer wanted to increase the "flow" of ideas in her writing, the researcher cued her to think about what she might do to achieve this goal rather than providing her with a predefined strategy for organizing ideas in text. When Jennifer evaluated how well her strategy was helping her achieve her writing goals, the researcher prompted her to compare current performance against objectives rather than telling her whether or not the strategy was effective. In general, rather than researching strategies or solutions between sessions and bringing them back to students, the teacher's role is to work collaboratively with students during sessions to find solutions to the problems they face.

A third characteristic is that teachers' support is designed to stimulate discussion about task performance and strategic processing in the context of students' experiences with chosen tasks. For example, by cueing Jennifer to think of options to achieve her writing goals, the researcher invited discussion about strategic approaches. In cases where a student is unable to think of an approach, the teacher might offer a suggestion. The goal in offering the suggestion, however, is to stimulate further discussion about strategic approaches, not to provide the best effective strategy. As a result, the teacher

emphasizes that suggestions are simply options which the student might consider. Similarly, to prevent the student from interpreting a single suggestion as the correct answer, the teacher may offer two or more options for consideration.

A fourth characteristic is that responsibility for making decisions about strategic approaches rests consistently with the student. For example, during discussions students are asked to decide which action to pursue based on evaluation of all suggestions discussed, whether they originate from the teacher or the student. This is one advantage of providing more than one suggestion at a time because, even when students have difficulty generating options for themselves, they can be actively involved in selecting among alternatives. Similarly, during discussions about the effectiveness of an implemented strategy, students ultimately decide whether to maintain, modify, or discard an approach.

Fifth, as an initial step in developing strategies, students are asked to perform their chosen task as they normally would. Because students bring prior knowledge to any learning task, for instance about tasks, strategies, content, and themselves as learners, they will have some idea of what activities to engage and what strategies work best for them. Discussion procedes from this experiential base. An important characteristic of the SCL approach is that strategy development then builds on what students can do. As the next step in developing more effective strategies, students are cued to evaluate the success of current approaches in achieving goals. To support this monitoring process, the teacher directs students' attention in particular to what they already do well, that is, to current activities which are effective in reaching goals. At the same time, it is important to support monitoring and revision or replacement of less effective activities. For example, the teacher might cue students to monitor the inefficiency of an approach (by observing the gap between strategy use and performance gain) and to think of alternative approaches that might be more successful.

Through discussions about tasks and strategies, students are encouraged to be reflective and planful about their learning. At the same time, students are prompted to think about the cognitive processes they have tried and to use language to communicate what works well for them. This is a sixth characteristic of the SCL approach—students are asked to describe strategies in their own words as a means of assisting them to construct an understanding of their cognitive processing. The teacher also actively promotes development of a shared language for discussing cognitive events. On one hand, the teacher continually assesses students' interpretations of her terminology and adjusts her use of terms to match students' understandings. At the same time, she is sensitive to a student's use of language and, whenever possible, discusses processing in terms the student prefers. The goal is to communicate about experiences with cognitive processing, not to teach specific language for referring to those events.

A seventh characteristic of the SCL approach is that students and teachers *collaborate* to define effective strategies and to engage in self-regulation. Teachers in SCL *do* give students suggestions about what they might try. Students select strategic approaches based on dialogues, during which both the student and the teacher contribute suggestions and ideas. SCL is not fundamentally discovery learning; students are not left to generate strategies by themselves.

That a teacher provides processing suggestions in SCL is not inconsistent with a constructivist perspective. Within a constructivist model, teachers communicate with students about concepts, theories, or aspects of cognitive processing after establishing common referents for discussion. Consider an example. When teaching content, a teacher may present concepts within an organized framework (e.g., an outline or concept map) to aid students' comprehension. However, during learning, the organizational framework provided by the teacher is not directly imported into students' knowledge structures. Instead, students actively interpret and integrate new information with prior knowledge to construct cognitive representations of the material (which may or may not

match the teacher's). Similarly, through language, a teacher can cue students to try different cognitive activities. However, when implementing a teacher's suggestions, the processes actually engaged depend on students' interpretations of what the teacher has said. Subsequently, rather than internalizing a teacher's description of strategic processing, students actively construct understandings about strategies based on both prior knowledge and experiences with tasks.

In Chapter 2, four potential challenges to current strategy training models were identified. These were (a) individualizing instruction to meet students' unique needs, (b) conveying the flexible and problem solving nature of strategies and strategic processing generally, (c) promoting students' construction of strategy knowledge, and (d) encouraging transfer and self-regulated learning across tasks. The SCL model was designed to respond specifically to these challenges. As a result, four general qualities of the SCL approach were defined. These were that (a) students develop routines that are effective specifically for them, (b) strategies are designed and flexibly implemented to achieve task related goals, (c) through dialogues, students are assisted to construct an understanding of their own processing as they try out approaches across related tasks, and (d) students are supported to develop strategies and self-regulate their learning to solve task related problems for themselves. Table 4 summarizes both the four challenges confronting intervention models and the four general qualities of the SCL alternative. Table 4 also depicts the relationship between the characteristics of the SCL approach described in this section and each of the general principles underlying the SCL approach.

To clarify the SCL intervention further, an extended example is provided below. This example is used to illustrate the approach and expand the description of the intervention. The example is drawn from Nancy's first intervention session. Prior to this meeting, during pretests, Nancy's writing was assessed as she completed an assignment for one of her courses. Her task on this assignment was to observe students in a daycare setting and then write a paper addressing specific questions based on her observation.

Table 4. Characteristics of the strategic content learning approach.

Challenges to current models of strategy training	General qualities of the SCL alternative	Associated characteristics of the SCL approach (1-7)*
Individualizing strategy instruction.	Students develop strategies based on prior knowledge, their unique tasks and goals, and processing strengths and preferences.	1. Students choose tasks and goals of immediate importance. Strategies are developed to help students achieve those goals. 4. Students decide what strategies to try and adopt. 5. Attention is directed to what students already do well as a basis for strategy development. 6. Students express strategies in their own words.
Representing strategies as a means of achieving task related goals rather than as an end of instruction by themselves.	Students develop strategies while engaged in meaningful tasks.	1. Intervention focuses on defining task-related goals and effective means of achieving them. 5. Development of strategies is guided by successes in completing meaningful work.
Promoting the development of strategy knowledge and transfer.	Students engage in strategic processing and construct an understanding of cognitive processing for themselves.	1. Students are supported to implement, evaluate, and refine strategies across time and similar tasks. 3. Teachers engage students in dialogues about strategic processing where students articulate understandings of their own cognitive processing. 6. Students abstract an understanding of strategies and define them in their own words.
Engaging students in the problem solving activities definitive of self-regulation.	Students are supported to engage in problem solving and strategic learning.	2. The teacher asks students to think through their own problems and to develop strategies rather than telling them what to do. 4. The responsibility for selecting, evaluating, and modifying strategies rests with students. 7. The teacher collaborates to develop strategies but provides suggestions, not best alternatives.

* Several characteristics are associated with more than one challenge.

Observation of Nancy's performance while completing this assignment provided valuable information about the goals she defined and her writing strategies. First, rather than returning to the assignment to review the questions asked, Nancy began describing the

children's activities at the daycare. Second, her strategy was to translate her rough notes into a final draft without organizing her observations. As a joint result of her interpretation of and approach to the task, Nancy produced a chronological description of the activities at the daycare rather than a targeted response to the questions asked.

To support self-regulation, the researcher began by supporting Nancy to define more clearly her goal in writing. From the beginning the student was actively involved in a discussion of goals and strategies in the context of actual coursework and in deciding which goals to adopt:

R: How would you describe what our goal is here with your writing? Do you have a sense yet?

N: My goal is?

R: Yah.

N: My goal is, basically, from my eyes, what I feel would be to answer these questions here, these four main questions, and to have 10 items that express various children playing. But to put, making sure that these four things are in.

R: OK, good. So, so, so look at, so you'll find that what I'm always doing, is I want to talk about your exact assignment, but I always want to kind of take a step back and kind of reflect on what you're doing.

N: Ah, OK.

R: So I agree that the first goal

N: OK.

R: See if this is consistent with what you think

N: OK.

R: Is to kind of take this assignment and figure out what the teacher's asking you, or the most important questions, and making sure you get them in your writing.

N: Exactly.

R: Does that sound like a reasonable goal?

N: Exactly, yah.

R: OK. So I'm going to take that as our goal. And you and I are going to work together to develop some strategies for doing that.

This excerpt illustrates that the definition of goals and the development of strategies took place in the context of meaningful tasks. Rather than completing tasks outside of the intervention and evaluating completed products during meetings, students worked through tasks during each session. This afforded the opportunity to intervene directly in approaches as students engaged in tasks.

During each meeting, discussion shifted between two levels. At one level, interactive dialogues focused on task completion as students implemented approaches and worked through tasks. At a second level, students were also encouraged to reflect on their learning: to define and select among alternative approaches, to evaluate their effectiveness, to monitor progress, and to modify goals and/or approaches if necessary. Whenever appropriate, and at least once per session, students formalized what they had learned from the meeting. Often this took the form of explicitly outlining the activities that formed current strategies. These were approaches that students would try, within or between sessions, to see how they worked. Students either dictated these steps to the researcher, who wrote them down in the students' own words (early sessions), wrote the steps down for themselves (later sessions), or in the cases of Mike and Jennifer, summarized steps orally, without writing them down .

This formalizing activity required students to mindfully abstract general principles about tasks and strategies based on experiences, thereby constructing for themselves an understanding of cognitive processes. Over sessions, students' developing strategies were tried, evaluated, and modified, and any changes were also formalized in explicit strategy revisions. In the end, specific strategies were defined. These strategies were

outlined by students in their own words based on evaluation of approaches while engaged in meaningful tasks.

As an example of the relative roles of the researcher and student in the definition of strategies, consider further excerpts from Nancy's first intervention session. Once Nancy had agreed that her task was to "figure out what the teacher's asking you, or the most important questions, and making sure you get them in your writing", the researcher and Nancy worked together to develop a strategy for interpreting assignments. First, the researcher asked Nancy to read the assignment one sentence at a time and to summarize the instructions orally. This served as a natural starting point for working on the assignment and at the same time allowed the researcher to assess where Nancy's difficulties lay (e.g., Did she have trouble comprehending written instructions? Or, did she read well, but have difficulty interpreting task demands?) so that the strategy developed would be responsive to Nancy's particular needs. It was quickly apparent that Nancy was able to read and summarize each sentence accurately. However, after the first two sentences Nancy realized that she really hadn't read each sentence carefully. She had just read the instructions quickly once and hadn't gone back to reread them before starting the assignment. In this case, Nancy was able to identify the origin of her problem without further support. In the following excerpt, the researcher built from Nancy's growing awareness of the need to read assignments carefully and then suggested the beginning of a strategy:

N: OK. See I read this, but I just read it, like, blah, blah, blah, blah, but I don't really comprehend and put, break down the sentences. I don't think I do that very well.

R: Well is this helping you?

N: Very much.

R: To break it down sentence by sentence?

N: Yah.

R: Well, look this is the beginning of a strategy.

N: Oh.

R: Whenever you face an assignment, maybe the first thing we should look at is reading it and really summarizing to yourself sentence by sentence what it is that they're asking you to do here.

N: Hm, yah. I don't do that very well at all.

R: But you're doing it very well.

Nancy continued reading the instructions one sentence at a time. A bit later the student and researcher reflected again on her activities and whether they were helping. In this excerpt, the researcher prompts Nancy to think about the approaches she is trying as strategies while Nancy continues to monitor the effectiveness of her previous approach:

R: OK? Is this getting clearer?

N: Yah, it is.

R: This is the first step in writing.

N: Oh, I don't believe how much I'd missed. I'm just like shocked right now. How much I don't read in between lines.

R: And how, and this is our first step. I think that will help you with your writing. Will be to have a really clear idea in your head of what it is you're supposed to write.

N: Oh, that's what I thought- now I notice that's exactly where my weak point is, is I don't read in between what they're reading. I just read observation, OK, observation

R: I observe and describe it.

N: Exactly. But she doesn't want that, she wants specific observations on specific targeted areas.

R: Absolutely.

N: Oh.

After Nancy finished reading the assignment, she and the researcher reflected on what they had done and formalized a strategic approach. Here Nancy was responsible for summarizing what she had gained during the meeting in her own words:

R: OK, the first thing I'd like to do is I'd like to take a step back for a second and have you reflect on what we did that was better, in this first step, which was understanding your assignment.

N: Um, what was better was I didn't understand first, when I read it, I, just read it, but I didn't really understand, I mean, I had an idea of what she wanted, I mean, you know, between the four things here, but I didn't really read this or this.

R: So if you were going to come to another assignment, OK, like let's say your next assignment, based on what we did, what would you do better, different?

N: I would, well my assignment there, I would read through each line and understand, like, analyze a line and split it apart until I understand exactly what it means.

R: OK, I'm going to, why don't we write these down.

N: OK.

R: And this is, and what we're going to do, is this is what I mean by starting to develop a strategy.

N: OK.

While in the preceding example the researcher suggested an approach which Nancy then tried and liked, in further exchanges Nancy assumed a greater role in suggesting alternatives. In the following excerpt from the same session, the researcher asked Nancy to think about what she might do to write answers to questions more effectively:

R: Is there something that you could do, to get ready now, given that you understand the assignment better, what kind of notes or something could you make to yourself now, more targeted notes?

N: Well, what I could do is I could try to break it down into this?

R: OK.

N: So, find out the indications of the children's interests, and point form them right down, the interests of the children.

R: OK.

N: And then categorizing the interests, that would be, in what, of these 10 interests, how it would be categorized,

R: OK, OK.

N: Write down 10 of those.

R: OK.

N: And possible teacher response in each one of the 10, how could it be, teacher response, just write down in this section what the

R: Excellent, excellent.

N: Oh, I just guessed really.

R: That's not guessing, that's thinking. That's thinking logically, and you know why you did that really well? It's because you have a clearer vision of what you need to do.

N: Yah, I do.

R: And notice how, notice how that's helping you know what to write.

N: Yah.

R: It's as simple as that.

One further example is provided to illustrate the SCL approach. This example is drawn from the seventh intervention session with Mike. Mike was learning to read and

study from a college level introductory psychology textbook. In previous intervention meetings Mike and the researcher had collaborated to develop a strategy to improve his reading comprehension. At this meeting Mike wanted to develop a strategy for studying (memorizing) material that he now understood. In the following excerpt, the researcher started by asking Mike to think of options. Once prompted, Mike generated quite a few ideas but seemed unsure as to which option would be best. As a result, the researcher's input centered on suggesting criteria for evaluating alternatives:

R: And then how are you, what are you going to do from there? To study? To try to remember it?

M: Well, there you go, that's the thing, right? I know how to grab up everything, right? But I don't know how to study it.

R: OK.

M: I guess I can read it.

R: OK. So you'll try rereading your notes a little bit.

M: Rereading my notes yah.

R: OK. Any other ideas of what you can do with them? With your notes once you've got them, to try to remember them? What do you do sometimes that helps you remember things?

M: I usually just go over them.

R: And a lot of times that's what students will do, they'll just kind of reread it a few times.

M: Yah.

R: But usually, that, they just, again, it's almost like rereading a book. You kind of understand it while you're reading it, and that's good, but it might not be quite enough to make sure you can really remember it without looking.

M: Maybe make some cue cards, or something?

R: You could try that if you want. That's something some students do that works.

M: Um huh.

R: OK, so making cue cards is an option. I'll make a note of that. This is where I want us to just kind of come up with some options. What other kinds of things could you do? (pause) Cue cards is good, because they tend to work, but they take a lot of time to make, and to test yourself.

M: That's the thing, yah. It is.

An excerpt from later in the same conversation illustrates how the researcher builds on the language Mike used to facilitate discussion about the cognitive processes employed:

R: How about just another context, what do you do if you want to remember something, like, what if you want to remember a phone number, or what if you want to remember anything, what kinds of things can you do?

M: I just say it over in my head, or I write it down.

R: OK. Write it down. So, writing it down is good, because you can always go back and get it later.

M: Yah.

R: But on a test you have to know it. So you can't do that. So but, so you, so how does it help if you repeat it in your head, without kind of looking at it. How does that help?

M: Well, it will embed it into your brain I guess.

R: OK, exactly. So that's something that helps in memory.

M: Yah.

R: To try to remember something. So how do you think you could apply that idea here?

M: OK, I guess I could just look at the word right? And then try to think, OK, what is it, right? And then just maybe try to go, voice it out, and then look at it, and say, yah, OK, that's what it was.

R: Yah, and sometimes that's what students try to do too, is, it's kind of, trying to repeat it back without looking, to try to get it, in, how did you say, embed it in your brain there.

M: Yah.

A bit later, Mike and the researcher discussed how he might rehearse information to try to remember it. In the following excerpt, Mike assumes a more active role in evaluating alternatives, so the researcher fades her support:

R: You can do it from the book, you can do it from your notes.

M: Notes probably would be better.

R: OK, why do you think notes would be better?

M: Because it would be in your own handwritten, you know, your own handwriting.

R: OK.

M: And it'll be in point form for what you need to learn, it's not going to go all in these other details that you're not going to really need to know.

Finally, at the end of the discussion, the researcher asked Mike what approach he wanted to try. The following excerpt illustrates how responsibility for making decisions about strategic approaches rested with the student:

R: So, so, out of all these, so of these options, what do you want to try specifically?

M: I want to do the, to repeat the, to read it, and then to repeat it in my head. And like, um, individually, to see how–

R: OK.

M: Link it.

R: OK.

Dependent Measures

Measures of Development, Use, and Modification of Strategies

Students' development and modification of strategies were evaluated using data from three sources. First, a summary of each intervention meeting was recorded on a meeting record form. These field notes described the process of strategy development in each intervention session. Second, after each session, for most students, whenever a strategy was developed or modified, details of the strategy were summarized on a strategy sheet. A series of these sheets thus chronicled the evolution of strategies over time. Finally, every meeting with each student was tape-recorded and transcribed.

To evaluate students' use of strategies within and outside of the training context, physical evidence of student's strategy use was gathered. For example, for students developing writing strategies (Jennifer, Joanne, and Nancy), notes, outlines, and rough drafts were obtained. For students working on reading comprehension or study strategies (Kathy and Mike), notes taken during reading were collected. Lastly, for the student working on solving math problems (Linda), copies were retained of assignments, exams, and notes made while solving practice problems.

Measures of Task Performance, Transfer, and Maintenance

Whenever possible, changes in task performance were assessed using actual course materials. Task performance was evaluated at pretest, on tasks completed as part of training, on tasks completed during the intervention but not addressed during training (transfer to the same task in another context), and when possible, on tasks completed in a subsequent semester (maintenance).

For pretests of writing performance, Jennifer and Nancy both assembled the information required to write their first course assignment. They were then asked to write

a draft of their essay/assignment as they normally would, without assistance from the researcher. For her pretest, Joanne chose an assignment out of her business writing text and wrote a letter based on that assignment. For all three students, samples of writing done for courses, as part of both assignments and exams, were collected throughout the semester to provide on-going measures of writing performance.

To evaluate the quality of writing, each of the writing samples collected from each student was evaluated on a scale from 1 to 5 across each of four dimensions: thematic salience, organization, idea flow, and clarity. Thematic salience referred to the degree to which a clear purpose for writing was established and carried through the writing sample. Organization referred to the overall structure and organization of the writing. Idea flow measured the quality of sentence to sentence transitions between ideas in the writing sample. Finally, clarity referred to the clearness of expression of ideas within each individual sentence.

Linda's scores on exams and assignments in her statistics course served as measures of her task performance. Because she was assessed at regular intervals throughout the semester and each piece of work was independently marked by her course researcher, this data seemed sufficient to chart her progress. Linda took one quiz (Q1) and completed one assignment (A1) prior to the intervention, and her scores on these assignments served as pretest measures. She took three more quizzes (Q2-4) and completed two more assignments (A2-3) during the intervention period. Further, at the end of the semester, all students in Linda's class were allowed to rewrite one quiz, and Linda chose to rewrite quiz #1. The new quiz (Q1R) provided a posttest comparison parallel to the pretest quiz. Finally, at the end of the semester Linda wrote a comprehensive final exam.

As a pretest measure of reading, Kathy read the first three pages of an assigned article and responded to written questions based on the reading. However, because Kathy was extremely anxious about her abilities following her injury, she clearly found the assessment stressful and upsetting. In order to reduce anxiety, rather than asking Kathy

to complete regular test-like written assessments, she read short passages and then summarized what she had read orally. As Kathy summarized, the researcher checked off main ideas included in the summary against the actual text, providing a rough but immediate measure of improvement. To provide a more systematic assessment of reading comprehension, at the end of the intervention, Kathy's verbal summaries were transcribed. Both these transcripts and the notes Kathy made while reading were then compared to the original reading passages. The dependent variable calculated was the percentage of ideas described accurately out of the number of ideas summarized.

Finally, because Mike was not involved in actual coursework, it was necessary to develop independent measures of his reading comprehension and study techniques. For each reading selection, the researcher developed a short quiz. The first quiz consisted of 10 recognition items (multiple choice questions) and 1 recall item (short answer question). Because Mike reported and demonstrated more difficulty with recall than recognition items after the first quiz, in all subsequent assessments at least 10 points were allocated to short answer or completion items, and 8-11 points were allocated to recognition (multiple choice/matching) items. Mike answered the short answer items first and was not allowed to return to those questions when completing the recognition items. To trace improvements in Mike's learning of the material, the percent correct on recall, recognition, and the total quiz were calculated. One of Mike's quizzes is provided as an example in Appendix 1.

Measures of Transfer to Other Tasks

In both pilot studies and the present study, students spontaneously described adapting or generating strategies for use in tasks other than those addressed during the intervention. These reports were unsolicited; at no time did the researcher query students as to whether they were employing their new strategies in other tasks. Nonetheless, each time a student mentioned strategic approaches to other tasks, the student's description was recorded on the Meeting Record Form. These records guided a systematic review of

transcripts from which excerpts were drawn. These excerpts provide evidence of students' developing disposition to attack a variety of tasks in a strategic and reflective manner.

Measures of Metacognition

Measures of metacognitive awareness about tasks and strategies were derived from two sources. First, students' written responses on the metacognitive questionnaire were rated on a scale from 1-3, where 1 and 3 represented low and high metacognitive awareness respectively. Scores on 6 of the questions (1 & 6-10) were averaged to produce an overall measure of metacognitive awareness.

Second, to compensate for potential difficulties students with learning disabilities may have in written expression, a measure of metacognitive awareness was derived from students' oral responses to the attribution/strategy interview. Specifically, oral responses were coded on a scale from 1-3 using criteria parallel to those used in scoring the metacognitive questionnaire. Two scores were derived reflecting students' awareness of task demands and of strategies respectively. These two scores were averaged to produce a second overall measure of metacognitive awareness.

Measures of Self-Efficacy

Data on perceptions of self-efficacy are drawn from several sources. First students rated their agreement on a scale from 1 to 5 with each item on the self-efficacy questionnaire. Ratings given to the first 10 items were averaged to produce a measure of each student's perception of competence and expectations for success on their chosen task. Ratings given to the second 6 items were averaged to produce a measure of each student's task preference. The average of all 16 items on the questionnaire provided an overall measure of students' perceptions of self-efficacy. For each measure, 5 represented the highest and 1 the lowest self-efficacy ratings respectively.

The metacognitive questionnaire provided additional data on students' perceptions of competence. As part of item 5 on this questionnaire, students were asked to rate

whether they were very below average, below average, average, above average, or very above average in ability on their chosen task. Student responses to this item were coded on a scale from 1 to 5, where 1 represented low perceptions of self-efficacy (very below average) and 5 represented high perceptions of self-efficacy (very above average).

Finally, the first question of the final interview asked students to describe what they had gained by participating in the study. It was anticipated that improvements in self-efficacy would be reflected in students' responses to that question. Analyses of transcripts from the final interview therefore provide data related to shifts in students' perceptions of self-efficacy associated with the intervention.

Measures of Attributions

Students' causal attributions for performance were assessed in two ways. First, often in research on causal attributions, students are constrained to make sense of their performance on predefined dimensions (e.g., ability, effort). As an alternative, the attribution/strategy interview allowed students to explain their performance in the absence of predefined constraints. The first two questions on this interview asked students to describe the factors responsible for times when they had done well or not so well on their chosen task. These responses were coded to extract the factors identified by students as important in determining their performance.

Second, a more structured written assessment of students' attributions was conducted after students responded to the oral, open-ended attribution/strategy interview questions. Students rated how much each of 10 possible factors was responsible for good or poor performance. Ratings were on a scale from 1 ("not a reason that I did well (didn't do well)" to 5 ("a major reason that I did well"). Thus, each student produced a single rating for each possible factor (ability, effort, luck, mood, task ease, motivation, setting, strategy, or help) for both pre and posttests.

Measures of Perceived Improvements and Explanations for Gains

Measures of perceived gains and of the factors responsible for those gains were derived from students' responses to the final interview. Responses were analyzed and then catalogued in terms of first, the types of gains reported, and second, students' perceptions of the intervention process and its relationship to reported gains.

Scoring Procedures

Measures of Development, Use, and Modification of Strategies

In order to evaluate students' involvement in the development and modification of strategies, the evolution of students' strategies over successive intervention sessions was analyzed. First, for each student, the steps comprising strategies at each intervention session were outlined by the researcher, based on a review of data from three sources: students' strategy sheets, the researcher's field notes, and the transcripts of the intervention session. Note that while the researcher was solely responsible for evaluating this evidence, she carefully protected against bias by checking each step against these three complementary sources of information. Annotated strategy records for all students are provided for inspection in Appendix 2.

For four of the six students (Nancy, Joanne, Linda, and Kathy), the evolution of strategies could be reconstructed almost entirely from written records on students' strategy sheets. Strategy steps were then verified based on a review of field notes and transcripts. For both Jennifer and Mike, however, information provided on strategy sheets was less informative. Because neither Mike nor Jennifer was comfortable writing down strategy steps, because neither referred to strategy sheets when they were written, and because both were able to articulate their strategies between intervention sessions without the aid of written cues, the researcher allowed these students to summarize strategy changes orally. Definition of strategy steps for these students therefore relied most on the researchers' field notes and on a review of session transcripts.

Once student strategies had been defined, each strategy step was coded on two dimensions. First, there were three ways in which strategy modifications were recorded: the student dictated changes to the researcher, who then wrote them down on the student's strategy sheet using the student's own words (R); the student wrote down any changes on the strategy sheets (S); or the student described the changes orally (O). Second, changes to strategies derived from three sources: the student defined the strategy step at pretest, before the intervention began (P); the step was based on collaboration with the researcher during the intervention session (C); or the student independently defined, evaluated, and adopted the strategy step outside of the intervention context (I). Note that, due to the nature of the intervention, during collaboration (C) students were actively involved in defining, trying, and evaluating strategy steps, and could therefore have introduced a step that ultimately was adopted as part of a strategy. However, in order to be coded as independently generated (I), the student must have thought of, implemented, and evaluated the step outside of discussions with the researcher. Criteria for coding strategy steps are summarized in Figure 6.

Finally, evidence of strategy use within and outside of the training context was provided by physical records of strategy implementation. Note that existence of a completed product was insufficient to document strategy use. In order to be acknowledged as evidence, records had to reflect implementation of defined strategy steps. For example, for Jennifer, strategy use was reflected in a sequence of outlines representing her movement through the planning process, not solely by the completion of an essay draft. Given these criteria, for each task completed, strategy records were recorded as present or absent.

Measures of Task Performance

All writing samples were evaluated on a scale from 1 to 5 across four common dimensions: thematic salience, organization, idea flow, and clarity. While the general quality associated with each dimension remained constant, criteria for scoring writing

Figure 6. Criteria for coding students' development of strategies.

Record of Strategy Step	
R	The student dictated the step, and the researcher wrote it down on a strategy sheet using the students' own words.
S	The student wrote the step on a strategy sheet in their own words.
O	The student described the step orally and the step was recorded on the researcher's meeting record form and on audio tape.

Source of the Step	
P	The student described the strategy at pretest.
C	The step was based on the discussion and collaboration between the student and researcher during an intervention session, where both were contributing and discussing possible methods.
I	The student independently defined the step outside of the intervention context.

samples were tailored to account for the type of sample (e.g., letters, essays written over time, responses to exams or particular questions) and the context in which they were written. Thus, criteria were parallel, but distinct for each of the three writing students. The criteria used to evaluate Jennifer's essays and exams are provided as an example in Table 5. A complete list of the criteria used in scoring writing samples from the three writing students is provided in Appendix 3.

Scoring was blind in that all information which identified the actual name of the student or the time at which the sample was written (pretest, intervention, maintenance) was removed before scoring. The same two raters then independently rated all writing samples on each of the four dimensions. Agreement between the two raters across all writing samples was 80%. Disagreements were resolved through discussion.

Linda's scores on statistics exams and assignments were obtained from her instructor, therefore no separate scoring procedure was required. The mean and standard

Table 5. Evaluating first year university essays and exams (Jennifer).

Theme	5	• Explicitly lays out the theme clearly in the introduction and follows throughout the essay/question.
	4	• Sets up the theme a bit indirectly within the introduction and follows it consistently throughout
	3	• Get an idea of the theme by reading the essay, it hangs together, but need to figure it out. Not clearly presented in the introduction.
	2	• Some common content in each section (some thread), but very choppy and hard to follow. No clear theme set out.
	1	• No theme apparent- a different topic in each paragraph instead of a coherent discussion of a topic. No clear connections.
Organization	5	• Essay: A clear introduction, body, and conclusion to the essay. Each paragraph/section has a clear purpose and hangs together. Similar theme/ideas grouped into paragraphs. Exam: Presents ideas logically and in order without jumping around.
	4	• Essay: Generally organized but some jumping around within sections. Exam: Sectioned but jumps within sections.
	3	• Essay: Can understand the organization, but it's choppy. Ideas bounce around between paragraphs or sections. Exam: Has an organization, but bounces around between sections.
	2	• Essay or Exam: Ideas seem related but no clear organization (stream of consciousness), no break up into clear sections
	1	• Essay or Exam: No apparent relationship between ideas or tie in to theme: no organization between sentences
Idea Flow	5	• Clear transitions between all sentences and all paragraphs, no sense of waiting to see where she is going or what the link is between sentences
	4	• Can follow flow, but some gap between sentences, not a smooth flow in between
	3	• Relationship between sentences is choppy, but you can figure it out: Sentences relate to each other in terms of the ideas expressed given the current topic being discussed (e.g., they tie in to some theme in a paragraph or section)
	2	• Hard to understand relationship between sentences, but they relate to the same topic generally ("big picture" or overall theme)
	1	• No clear relationship between ideas from one sentence to the next either in transition or in terms of the topic addressed
Clarity	5	• Each sentence stands on its own and expresses an idea clearly
	4	• Can figure out meaning of sentence, but minor choice of words or construction problems hinder understanding slightly
	3	• Can figure out the meaning of sentences with a little effort- ideas not succinctly expressed. Need context to clarify meaning
	2	• Hard to figure out meaning- sentence not very clear in expression of idea
	1	• Sentences make no sense, can't figure it out at all.

deviation of marks obtained by all students in Linda's class (n=19) were also available for comparison.

To evaluate Kathy's reading comprehension performance, both oral summaries of passages and notes taken on reading were examined. While it was originally planned to

calculate the percentage of main ideas summarized correctly out of the number of main ideas appearing in texts, this dependent variable would have been meaningless in the current context because Kathy's need to be more or less complete in her summary of ideas differed across tasks. As a result, a measure of improvement was devised which did not rely on a measure of the absolute number of ideas reported. This was the percentage of ideas described correctly out of the number of ideas summarized.

To calculate this dependent variable, Kathy's notes and verbal summaries were broken down into lists of idea units. Two independent raters then matched the ideas summarized against the ideas appearing in the original passage. Scoring was blind in that all information which identified the actual name of the student or the time at which the summary was made (pretest, intervention session, date) was removed before scoring. Each idea was rated as correct if the idea was either a faithful summary of ideas in the text or a reasonable inference directly related to those ideas; or incorrect if the idea expressed was unclear or vague, was not related to the material being read, or was a misinterpretation of ideas in the text. Agreement between the two raters when coding verbal summaries was 93% and when coding notes was 98%. Disagreements were resolved through discussion.

Finally, to evaluate Mike's reading comprehension quizzes, scoring criteria were developed for recall and recognition questions. Scoring was blind in that all information which identified the actual name of the student, the time at which the quiz was written, or the location in the book from which the material was drawn were removed before scoring. Two raters then independently scored each question using the established criteria. Agreement between the two raters was 94% and 98% for recall and recognition items respectively. Disagreements were resolved through discussion.

Metacognitive Questionnaire

Student answers to the six relevant questions on the metacognitive questionnaire were qualitatively coded in terms of the amount of metacognitive awareness of tasks and

Table 6. Scoring criteria for six questions on the metacognitive questionnaire.

Item 1: Task Description	
3=	A good and accurate description of central task requirements (vs. mechanical aspects).
2=	A partial description.
1=	Focus on mechanical aspects of the task.
Items 6-8: What do people have to learn to be better at the task?	
3=	Accurate description of central task requirements and cognitive activities required in completion.
2=	Some accurate description of the task, but incomplete or not clear. Mention of strategies or need to practice, but not thoroughly articulated.
1=	Focus on mechanical aspects of the task, not task related, very general.
Items 9-10: Description of thinking involved to complete the task:	
3=	A clear and articulated description of strategies or thinking about the main processes in task completion (cognitively what are they trying to achieve) (e.g., getting a clear understanding) and *how they might get there.*
2=	A description of rudimentary processes- not clearly articulated but some kind of strategy or cognition mentioned
1=	Not strategic or clear. *Minimal sense of how to achieve the desired product.*

strategies reflected in the response. Scores were on a scale from 1 to 3, following guidelines established in previous research (Wong, 1986). Coding criteria are presented in Table 6. A total score was constructed by averaging across the 6 items.

Scoring of the metacognitive questionnaires was blind in that all information which identified the student or the time at which the sample was written (pretest, posttest) was removed before scoring. Two raters then independently rated each questionnaire. Agreement between the two raters was 83%. All disagreements were resolved through discussion.

Self-efficacy Questionnaire

Responses to the self-efficacy measure were rescaled so that ratings of 5 consistently referenced positive feelings of self-efficacy. Three scores were obtained by averaging across the 10 questions on students' perceived competence (part 1), across the 6 questions assessing task preference (part 2), and across all 16 questions separately.

Attribution and Strategy Interview

Students' answers to the interview were tape-recorded and transcribed. These transcripts were then submitted to systematic qualitative coding (Miles & Huberman, 1984). Coding was blind in that all information which identified the student or the time at which the interview was conducted (pretest, posttest) was removed before scoring.

First, to code responses to the open-ended attribution questions, the researcher set a tentative list of causal factors based on those identified in previous research (Relich et al., 1986; Schunk & Rice, 1986; Weiner, 1974). This preliminary list was comprised of the 10 factors included in the attribution questionnaire. Second, the researcher read each of the responses and added to or subtracted from the list based on her perceptions of the factors identified by students. The researcher and an independent rater then independently coded causal explanations in terms of the revised list. Agreement between the raters was: 93% on identifying codable statements; 95% on coding identified statements similarly; and 88% overall (for statements both identified and coded similarly). Disagreements were resolved through discussion. The final codes used to categorize causal statements, both those drawn from the original list of 10 (top) and those abstracted from student responses (bottom), are presented in Table 7.

Second, students' responses to the entire interview, in particular to the third question, were evaluated to derive a measure of metacognitive awareness about tasks and about strategies. To accomplish this, two raters independently identified statements that contained descriptions of either tasks or strategies. Task descriptions included discussions of goals associated with a task or of the characteristics of quality products. Strategy descriptions included discussions of processes engaged or approaches employed to achieve a desired product. Next, the collection of task and strategy descriptions from a given interview were rated holistically on a scale of 1 to 3 using criteria parallel to those used in scoring similar questions on the metacognitive questionnaire. These criteria are presented in Table 8.

Table 7. Codes assigned to causal attributions in the attribution/strategy interview.

Code	Explanation
• Ability	• They do well because they are good at the task, because of some positive aspect about themselves, because of some aspect of their cognition or memory. They don't do well because they are poor at the task, because of some negative aspect about themselves, because of limitations in cognition or memory.
• Effort	• They do well because they try hard, they do a task over and over, they persist. They don't do well when they don't try, they give up, they don't put in the effort.
• Strategy	• They do well when they know what they are supposed to do or they know how to go about tackling the task (including asking for help strategically). They don't do well when they don't know what they are supposed to do in a task or don't know how to accomplish it.
• Interest	• They do well if it is a task or subject that interests them. They don't do well if they don't find the task or topic interesting.
• Setting	• They do well if they work in a good setting. They don't do well if the setting is distracting or unsatisfactory in some way.
• Ease	• They do well if the task is easy, familiar or simple. They don't do well if the task is difficult, unfamiliar, or complex.
• Help	• They do well if help is available from another source (a computer, another person). They don't do well when help is not available.
• Holistic	• How they do is dependent on their whole day in some way- whether they got enough sleep and are rested, rather than exhausted, whether their schedule is such that they have enough time to complete a task.
• Anxiety	• They do well when they don't panic, they relax, they aren't taken away from the task by stress and anxiety. They don't do well when they panic, are under too much stress, or are anxious.
• Progress	• They do well when they can see progress and that they are improving on a task. They don't do well when they can't seem to get anywhere, they see no progress and as a result get frustrated.

Using these criteria, the researcher and an independent rater independently assigned holistic task and strategy scores to each transcript. Agreement between the raters was 89%. Disagreements were resolved through discussion.

Table 8. Criteria for scoring task and strategy descriptions from the attribution/strategy interview.

Task Descriptions	Understanding of task goals as reflected in overall discussion, an awareness of what makes a good product in terms of central task demands (parallel to question #1 on the metacognitive questionnaire). 3= a good, accurate description of central task requirements . 2= a partial description 1= focus on mechanical aspects of the task.
Strategy Descriptions	Description of strategy used or processes necessary to complete the task (parallel to questions 9-10 on the metacognitive questionnaire). 3= A clear and articulated description of strategies or thinking about the main processes in task completion; *how they might get there.* 2= a description of rudimentary processes- not clearly articulated but some kind of strategy or cognition mentioned 1= not strategic or clear. *Minimal sense of how to achieve the desired product.*

Final Interview

Student responses to final interview questions were tape-recorded and transcribed. These transcripts were then submitted to systematic qualitative coding (Miles & Huberman, 1984). To maximize comparability in coding across raters, sections of students' uninterrupted speech were assigned sequential numbers. Each rater then assigned as many codes as applied to each section. Coding was blind in that all information which could identify a student was removed before scoring.

Two sets of codes were established, the first to assess perceived gains associated with the approach and the second to catalogue students' explanations for those gains. To identify perceived gains, a list of potential codes was identified by the researcher based on a reading of student responses. This list was then modified through discussion with another rater. The final codes used in categorizing perceived gains are presented in Table 9. To identify students' perceptions of the process of intervention and of explanations for perceived gains, a second set of codes was developed. Five major classes of explanations were identified. Within three of these a number of sub-categories were

Table 9. Codes used to categorize perceived gains in the final interview.

Code	Explanation
• Task Approach	• The student reported a gain in awareness of task goals or of a method for achieving goals more effectively.
• Self-efficacy	• The student explicitly reported felling more competent, confident, or in control of task performance.
• Performance	• The student described improvement in task performance or the creation of better products (e.g., better marks, clearer essays).
• Interaction	• The student benefited from the interaction and discussion that were integral parts of the approach.
• Career	• The student profited by being clearer in terms of a career direction.
• Reflect	• The student gained greater awareness of their own thinking, or became more reflective and problem solving in their approach to tasks.
• Goal left	• The student identified some goal that remained that was not directly impacted as a result of the intervention. When this code was given, the rater indicated the nature of the goal which remained.

outlined. These codes were also initially identified by the researcher and then modified through discussion with an independent rater. The final codes used in categorizing students' perceptions of the intervention are presented in Table 10.

Based on these coding systems, the researcher and an independent rater each assigned codes to speech sections in the final interviews. Because raters could easily focus on different aspects of speech sections, assigning a range of codes to each, it was decided that raters should clearly indicate the specific text being assigned a certain code. Agreement was then assessed by comparing codes assigned to the same text sections. Overall agreement was calculated in two ways. To begin, a comparison was made of all codes assigned to common text within each speech section. In order to count as agreement, *every* code commonly assigned within a given speech section had to be identical. Determined in this way, interrater agreement across transcripts was 87%.

Table 10. Codes used to categorize students' perceptions of the intervention and explanations for perceived gains.

A	*Quality of Interactions*: • Guiding • Suggestions • Fading • Thinking • Discussion	 • The teacher's role was to guide, cue or direct students, or to push them in the right direction • The teacher gave suggestions, options, strategy pointers • The teacher encouraged students to become more and more independent • Students were active in thinking through issues; the teacher didn't tell them what to do or give them answers, but made them work through problems, taking the time to let them think it out • There was a focus on discussion, dialogue, or collaboration
B	*Building, Trying, and Modifying Strategies*: • Applying Strategies • Define Goals • Trying Strategies • Monitoring	 • Students applied strategies in actual tasks, were able to see how they worked in context, learned to work through strategies by trying them out, or developed strategies by working through tasks • Task goals were defined • Students tried out different options, approaches, or strategies • Students monitored how it worked and modified approaches
C	*Personalized Strategies*: • Ownership • Unique • Building • Made sense	 • Students were responsible for deciding what was good for them, and for their work • The strategies developed worked for them, not for others • The approach built on the student's strengths, preferences, or what they knew • The processes involved, the task, or the strategies made sense to them, they were in expressed in the student's own words, students really understood them
D	*Positive*	• Students perceived the environment to be positive, reinforcing, and supportive, with a focus on what they did well rather than on what they did wrong
E	*Time*	• The support was provided on a flexible time line, worked within a student's schedule, or focused on immediately important tasks

Second, agreement was also assessed separately for raters' categorization of perceived gains and perceptions of the intervention process. These agreements were 92% and 95%, respectively. All disagreements were resolved through discussion.

IV. RESULTS

Analyses of data pertinent to each of the research questions posed at the end of Chapter I will now be presented.

Did students demonstrate active involvement in the development, use, and modification of strategies during the intervention?

In order to assess students' involvement in developing and modifying strategies, the evolution of each student's strategies over time was summarized. Each strategy step was coded in terms of the way in which it was recorded (dictated by the student to the researcher and written on a strategy sheet (R); written by the student on a strategy sheet (S), or described orally by the student (O)) and in terms of the origin of the strategy step (brought to the intervention by the student at pretest (P), chosen based on a collaboration with the researcher during the intervention (C), or independently defined and evaluated by the student outside of the intervention context (I)). An annotated chronicle of each student's strategy development and the codes assigned to each step are presented in Appendix 2.

A review of students' strategy records both illustrates the scaffolded support provided during the intervention and traces students' active involvement in the construction and evaluation of strategies, within and outside of the intervention context. First, during the intervention, students were supported to reflect on approaches, consider their relative effectiveness, and to decide for the future what strategies to try out. Four of the six students (Jennifer, Joanne, Kathy, and Linda) started by dictating their strategy choices to the researcher, who wrote down verbatim what the student had said (R). This process both supported reflection about processing and illustrated the process of strategy development. In later sessions, each of these students more independently recorded strategy modifications, either in writing on strategy sheets or orally (S or O). Neither Mike nor Nancy was provided with the same initial support. Mike moved to writing and orally summarizing his strategy in the first intervention session (S or O). Nancy didn't

formalize any steps until intervention #3, by which time she was comfortable writing down her strategy in her own words (S). In general, researcher support was faded as students more independently recorded strategy modifications in their own words.

The fading of support and students' increasing independence in strategy development is also evidenced in changes in the source of strategy steps across sessions. For example, while Joanne came to the intervention with the skeleton of a strategy (P), for the most part, students' strategy steps were abstracted from discussions (collaborations) during task completion (C). Because of the nature of the SCL approach, from the beginning students were active contributors to strategies developed through collaboration. First, as early as the first intervention students suggested alternative approaches to task completion. Two examples of this were provided earlier, when illustrating the SCL approach. Another brief example can be drawn from Mike's (M) fourth intervention meeting. In this excerpt he is considering what he might do as part of his reading strategy:

M: OK, I guess my strategy could be this way, too. I could read it, and understand it first, before I even start writing anything down.

R: OK.

M: And then, um, I think that would probably be the more important thing right there, would be actually reading it.

R: OK, yah, after you get kind of the big picture.

M: Yah, just read the whole thing, and then really understand it before I even start writing it at all.

R: OK, and then what?

M: And then go each paragraph. Just, or I don't know. I mean. Yah, I guess, I go each paragraph at a time, see what involve, the important ideas are in there. Take them out, and then go onto the next one.

R: OK, good idea.

M: I think yah, I think it would be a better idea if I read the whole thing.

Not only were students involved in suggesting alternative approaches, but students were also ultimately responsible for selecting between methods and for describing strategies in their own words. Even in cases where the researcher initially wrote steps down for students (R), the researcher faithfully used the students' language. Thus, in the process of collaboration students were involved in strategy development by suggesting approaches, by selecting between possibilities, and by defining strategy steps in their own words.

While the majority of strategy steps were defined through instructor–student collaborations (C), 5 out of the 6 students also independently added steps to their strategy based on approaches they had tried and evaluated outside of discussions with the researcher (I). As a general trend, students moved from dictating steps based on collaboration (R/C), to more independently writing or describing what they understood based on the collaboration (S/C or O/C), to more independently defining and evaluating strategic approaches (S/I or O/I). This evolution is consistent across students and can be observed through inspection of students strategy sheets (see Appendix 2). These data suggest that students became more self-regulating over time, ultimately defining and monitoring strategic approaches outside of the intervention context.

This trend can be illustrated with two examples. First, consider the course of Kathy's strategy development. During her pretest reading assessment, the researcher noted that Kathy simultaneously implemented a range of reading strategies but did so in a fragmented, unfocused way. The researcher wrote, "She tries early to link new information with other texts, before she really has a sense of what she is trying to read... She's almost confusing herself by bouncing back and forth between material—not getting the flow within a single text." At the first intervention meeting, Kathy suggested three initial approaches that had helped her "over the weekend". These ideas served as the

foundation for the first strategy developed. However, the instructor stressed the importance of sustained attention to the material being read, of pulling out the main ideas from that material, and only then connecting ideas across sources. At the end of this session, the instructor asked Kathy to reflect on steps she might follow while reading. Kathy orally described four steps and the researcher wrote them down on a blank piece of paper (R). Three of these were based on her discussion with the researcher (R/C). The last was one that Kathy had tried and liked over the weekend (R/I). This list served as Kathy's first strategy sheet.

After trying the strategy and discussing its use during intervention #3, Kathy rewrote the steps in her strategy on a new strategy sheet (S/C). During intervention #4, Kathy and the instructor continued to try out, monitor, and discuss strategy use. Based on these experiences, Kathy modified her strategy. Two points were written by Kathy (S/C), and one was dictated by Kathy but recorded by the researcher (R/C).

By the seventh intervention session Kathy's understanding of her strategy had evolved. She stated that her strategy was comprised of three main parts: reading (and focusing), interpreting, and writing (taking notes which reflected Kathy's interpretation of main ideas.) At this meeting Kathy rewrote her strategy one more time. She described the strategy independently and in her own words, using capitals and underlining to emphasize critical points: FOCUSING on one <u>CHUNK</u> at a time, abstracting the <u>MAIN IDEA</u>, and then <u>LINKING</u> across chunks (S/C). At the same meeting Kathy also collaborated with the instructor to develop a strategy specific for reading empirical research reports. She wrote out this strategy on a different strategy sheet (S/C). On this sheet Kathy described the purpose of this second strategy: "This will help me focus on what I am <u>looking for</u>" (S/C).

During intervention #9, Kathy reported using her main reading strategy in the context of a different task. Specifically, she was using her strategy to focus on pulling main ideas out of *lectures*. This indicates that Kathy was beginning to think strategically

when approaching a different task with a similar goal. At this meeting Kathy stressed the importance of developing a strategy on time management (S/I), and the instructor initiated discussion about the importance of distributing reading over a series of smaller time periods (e.g., 1-2 hours) rather than massing reading into longer blocks of time (e.g., 4-5 hours). Based on this discussion, Kathy outlined a new strategy (S/C).

During intervention #10 Kathy added one subpoint to her main reading strategy and elaborated her article reading strategy (S/C). At the next meeting, Kathy overgeneralized the application of one of her strategies. Although she was reading a *conceptual* article, she tried to interpret the article using her *empirical* article strategy. She looked for the hypothesis, the method, and the results and summarized the article in those terms. The instructor stressed the importance of reflection when using strategies and of using strategies flexibly in response to changing task demands.

At the beginning of intervention #12, Kathy announced that she needed some kind of cue that would remind her to use her new strategies flexibly. Kathy decided to write for herself a "Rule of Reading" and to refer to this Rule before any reading task (S/I). This illustrates that, by the end of the intervention period, Kathy was generating strategies for herself in response to perceived obstacles in task performance. Kathy's generation of strategies maintained in subsequent work. The instructor met Kathy for three maintenance sessions during the following semester. Three months after the end of the initial intervention period, Kathy brought in a strategy she had developed to guide her in writing a criticism of a sociological novel (S/I).

While Kathy's case was perhaps the most dramatic in terms of the independent generation of strategies, Joanne's was perhaps more typical. As noted above, at pretest Joanne outlined a strategy she currently used to write letters and the researcher wrote it down (R/P). During interventions 2 to 6, Joanne and the researcher worked through writing a series of letters and collaborated to define, implement, and evaluate different approaches. Based on these discussions, at each session Joanne dictated changes to the

Figure 7. Joanne's independent revisions of her strategy during intervention #7.

Final Strategy

1. Find out what you're writing about
   - *Read slow, listen to each word*
   - *If you don't understand what you are going to write about, reread it again and again.*

2. Make out points of specific things you want to include
   - Be more specific and to the point
   - Read around for other points that go together
   - Consider what you should and shouldn't include- what does the reader need to know?
   - Consider the audience's point of view

3. Organize the points so they make sense
   - Look again for points that go together
   - *Depends on the situation of the letter*
   - Think about what the audience would want to hear (not negative)
   - Number your points

4. Write the letter—a rough draft
   - Try to be less complex- more like how you talk- more direct
   - Keep in mind what you're writing about- reread and keep in mind the whole picture

5. Go back and read each sentence and paragraph. Change it until it makes sense.
   - *Reread the original materials (e.g., correspondence or cases)*
   - Go back to the points all the time, to see if you missed at the time
   - Keep rereading word by word- go slower
   - *Ask yourself, does it make sense, not just to you, but to someone else*

6. Spell check, check format, check style
   - Have someone proof read if necessary
   - Look back on references for examples *(in book or correspondence)*
   - Commas: use a "pause"- read sentence and where you pause, you usually need a comma
   - Look for sentences that can be broken up
   - Grammar- check back to Chapter 21 for grammar and examples

Note: Italics denote added material at this session.

researcher who wrote them down on a modified strategy sheet (R/C). During the 7th intervention session, Joanne was reading a textbook chapter in preparation for writing a letter. As a result, for a short period she and the researcher were working independently on separate tasks. During this interval, Joanne picked up her strategy sheet, which was

laying on the table, and started to revise it independently (S/I). Figure 7 outlines the revisions she made. Points that were added during collaborations prior to this intervention (R/C) are printed in standard typeface; points she added independently during this particular session are italicized.

In sum, the evidence described in this section suggest that students were actively involved in the development of approaches and in the construction of an understanding about strategies. Further, the data confirm that over time students became more independent at generating, monitoring, and modifying strategies. Note that as a result, even when students worked on similar tasks, the strategies they developed were quite different (see Appendix 2). While Joanne, Jennifer, and Nancy all worked on writing tasks, and while their strategies shared certain core characteristics (e.g., they all had some kind of planning, drafting, and revising elements), the exact form of each student's strategy was individualized. Similarly, while Kathy and Mike both worked on reading and studying from texts, their strategies also differed in fundamental ways. As an example, differences between Mike's and Kathy's final strategies can be observed in Figure 8.

Differences in students' strategies can be traced to the process of developing strategic approaches. First, students' problems with tasks varied and their specific goals differed. Second, students based strategy selection on their unique preferences for particular approaches. Finally, students made sense of their cognitive processing using different terms. In the end, students' strategies were tailored to their unique needs and were described in terms they could understand.

Did students transfer strategy use to similar tasks in other contexts and maintain strategy use into the next semester?

Data pertaining to the transfer and maintenance of strategy use were derived from two sources. First, many researchers cite improvement in task performance as an indication of strategy use under the assumption that performance level is associated with

Figure 8. A comparison of Kathy's and Mike's reading strategies.

Kathy's Final Reading Strategy	Mike's Final Reading Strategy
WHAT ROLE DO THESE SUBSECTIONS PLAY? *GOAL -> To subtrack Main IDEA* 1. Read Title • Obtain clue about reading task 2. Review Format of Reading Material • Divide into Chunks • Remember what each chunks purpose is, i.e.. intro 3. Read Title (if any) of Chunks to obtain clue about Reading Task 4. When Reading FOCUS only on CHUNK 5. When you have Finished Reading Chunk- Ask yourself what the MAIN IDEA Is. (Interpret in your own words and then write it down) 6. After Reading whole Task try to LINK each CHUNK 7. If CHUNKS Become to Difficult to Focus On Divide CHUNKS Into Sub-CHUNKS and then LINK	A. Reading Chapter 1. Focus not just on understanding paragraphs, but also on recognizing the links between ideas: the whole structure. 2. Compare/Contrast points and see relationships. 3. Understand the arguments the authors are trying to make before moving beyond it, to make inferences. 4. Use charts and pictures as aids, not as a substitute for reading. 5. Look for clues as to what is important (e.g., stressed words, linking ideas across sentences, signaling words). 6. Clarify unclear words that are important to comprehension. B. Studying Text Information 1. Read once to understand main direction. 2. Read again, each paragraph, making links. 3. Write on each topic. 4. Reread notes. 5. Repeat in his head to see how that works. 6. Link with everything. C. Learning New Terms 1. Study- learn- pronounce properly. 2. Write on paper. 3. Look at the correct word. 4. Repeat and practice. *5. Visualize the term in your head.*

implementation of strategies. In this study, task performance improved not only on training tasks but also on similar tasks in other contexts or in a subsequent semester. Thus, these data imply that students did transfer and maintain use of strategies. Task performance data is presented in the next section.

To more directly measure strategy implementation, physical evidence of strategy use was also collected. For example, evidence of strategy use by writing students consisted of rough notes, organized notes, outlines, and/or rough drafts written in

preparation for assignments. These records indicate that all writing students transferred strategy use to similar tasks completed in the same semester, and that at least two of the three students maintained strategy use into the next semester (data on the third was not available). Specifically, Jennifer produced "plans" and drafts both for a psychology paper written independently during the intervention semester (transfer) and for an English essay written in the next semester (transfer/maintenance). Joanne provided notes and drafts written for an in-class letter writing assignment (transfer). Nancy supplied "point forms" and drafts for both an assignment and a take home exam completed during the first semester (transfer) and for an essay written for a different course during the subsequent semester (transfer/maintenance).

Linda developed two distinct strategies during the intervention. The first was targeted at helping her to study math so that she could learn statistics concepts independently. The second strategy focused on representing problems in terms of conceptual knowledge and then systematically solving them. For Linda, physical evidence of strategy use therefore consisted of notes taken either while grappling with statistics concepts (where she demonstrated analysis and linking of concepts) or when solving practice problems (where she demonstrated working systematically through problem steps). Linda diligently furnished rough notes produced when practicing problems, when studying her course notes, when completing course assignments, and when taking tests. Thus, there was considerable evidence of Linda's consistent use of strategies across contexts (transfer). Data on Linda's maintenance of strategy use into a subsequent semester were not available.

Because Mike wasn't taking any courses which required reading and studying from texts, he did not have an opportunity to transfer strategy use to similar tasks in other contexts. He did, on the other hand, provide clear evidence of adapting strategies advantageously when attacking different tasks. This evidence will be described below. Finally, physical evidence of Kathy's use of strategies was in the form of notes taken on

reading passages (because part of her strategy was to write summaries of the main ideas within sequential "chunks" of text). This data indicates that Kathy used her strategy when independently reading assigned texts during the intervention period (transfer) and when reading course texts in the subsequent semester (transfer/maintenance).

In sum, physical evidence of transfer of strategy use to similar tasks in other contexts was available for 5 out of the 6 students. Further, at least 3 students transferred strategy use to similar tasks in a subsequent semester.

Did task performance improve on training tasks and on similar tasks completed either in other contexts (transfer) or during the next semester (maintenance)?

Data on each student's task performance are reported separately. For each, results are presented chronologically in both tabular and graphic form. This presentation allows for both in-depth look at the progress of individuals and for abstraction of common trends across participants.

Data from the three writing students are presented first. For each student, writing samples were rated holistically on a scale from 1 to 5 across each of four dimensions: thematic salience, organization, idea flow, and clarity.

Jennifer. Table 11 presents the ratings assigned to each of Jennifer's writing samples at pretest, during the intervention period, and in the following semester. Average ratings across dimensions were calculated to represent the overall quality of each piece of writing. These averages are presented graphically in Figure 9.

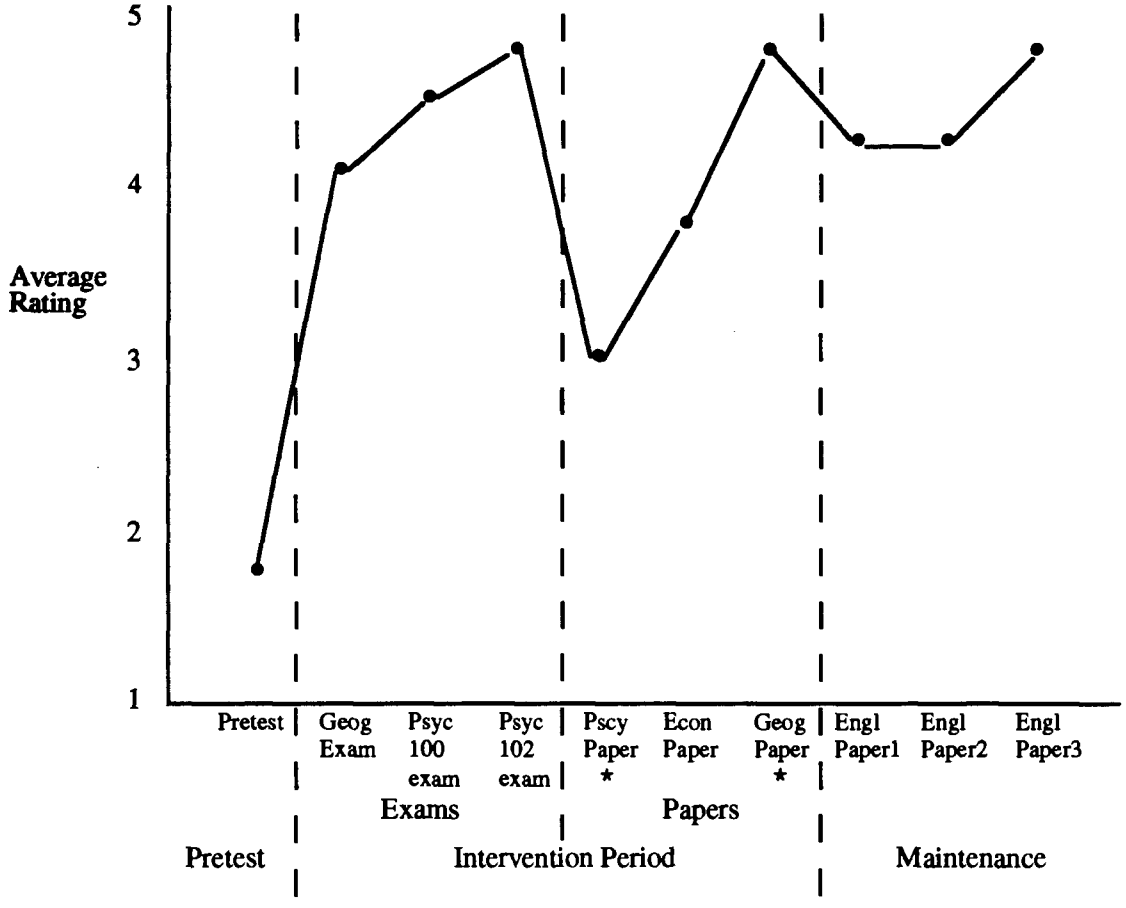
These data indicate that at pretest Jennifer's writing was problematic across all four dimensions, receiving an average rating of 1.75 out of the possible 5. During the intervention, performance improved first on exams (average ratings of 4.08, 4.50, and 4.75, respectively) and second on essays (average ratings of 3.00, 3.75, and 4.75, respectively). Improved performance maintained on the three essays written in the subsequent semester (average ratings of 4.25, 4.25, and 4.75, respectively).

Table 11. Achievement data Jennifer—Writing essays for first year university courses.

	Pretest	Geog exam	Psyc 100 exam	Psyc 102 exam	Psyc paper *	Econ paper	Geog Paper *	English Paper 1	English Paper 2	English Paper 3
Thematic Salience	1	4	4	5	3	5	5	4	5	5
Organization	2	4.66	5	5	3	4	5	4	4	5
Idea Flow	2	4.33	5	4	3	3	4	5	4	4
Clarity	2	3.33	4	5	3	3	5	4	4	5
Average rating (1-5)	1.75	4.08	4.50	4.75	3	3.75	4.75	4.25	4.25	4.75

* Papers we worked on together from the beginning of the semester

Figure 9. Jennifer's average ratings on writing in exams and essays.



* Papers we worked on together from the beginning of the semester

Jennifer worked with the researcher on only two writing assignments during the intervention (and on the plan for an oral report). Performance improved on these training tasks (indicated with an "*" in the table and figure). Data also indicate improved performance on similar tasks across contexts. For example, Jennifer's writing improved when responding to essay questions on her midterm exams. Writing quality was also superior on an independently written economics paper. Finally, performance improvements maintained on three essays written for an English course in the following semester. These data parallel those reported earlier on the transfer and maintenance of strategy use.

Nancy. Table 12 presents the ratings assigned to each of Nancy's writing samples at pretest, during the intervention, and in the subsequent semester. Average ratings across dimensions were calculated to represent the overall quality of each piece of writing. These averages are presented graphically in Figure 10.

These data indicate that, at pretest, Nancy's major difficulties were relaying a consistent theme and in structuring her writing. The average of ratings assigned to her pretest writing sample was 2.25 out of a possible 5. During the intervention, Nancy's writing improved (average ratings of 4.25, 3.00, 4.00, 3.75, 3.81, and 4.00, respectively). Her performance also remained above pretest levels at maintenance (average rating 3.50).

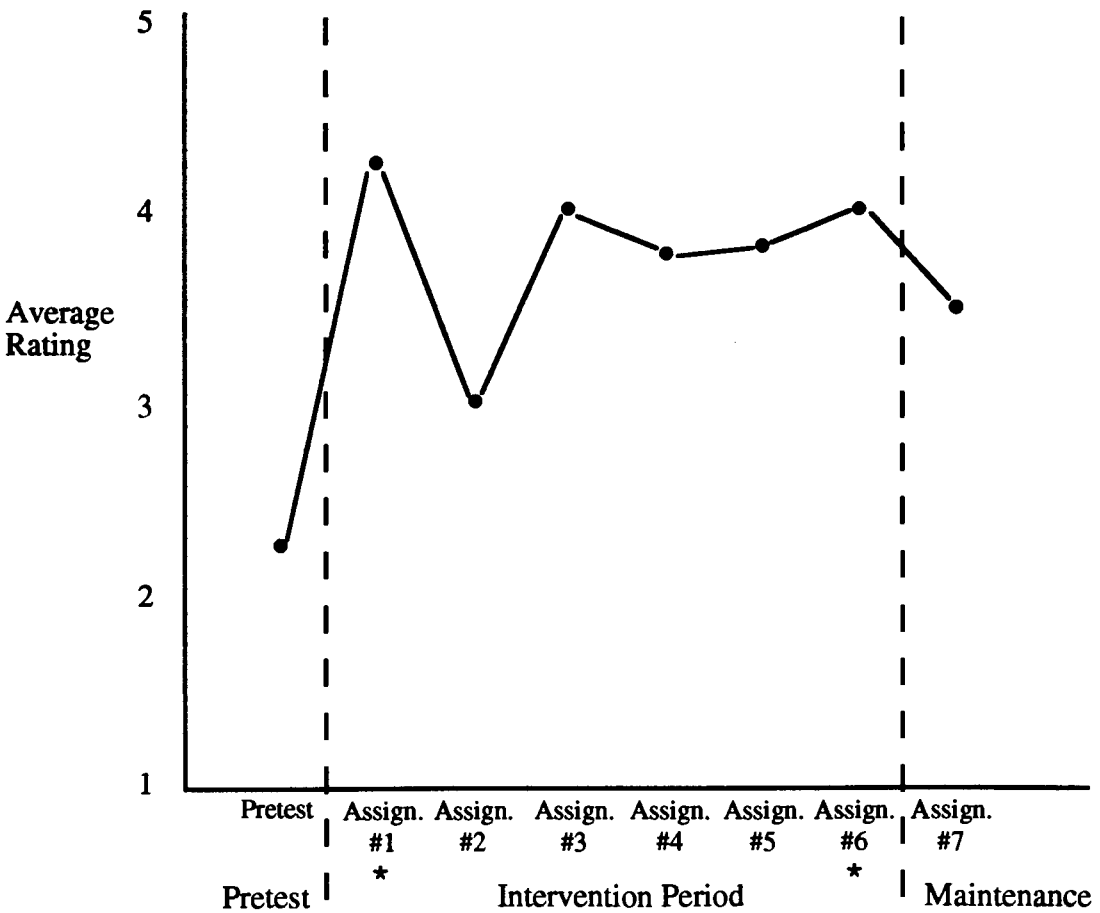
Nancy worked with the researcher on two of her writing assignments (#1 and #6, marked with an "*" on the table and figure). That the instructor worked with Nancy on the first assignment may account for the relatively high performance on that task. Improved performance on assignments #2 through 5 suggests transfer of strategy use to similar tasks across contexts. Further, Nancy's improved performance maintained on a different kind of writing assignment (a movie review) completed in the following semester. These data parallel those reported earlier on the transfer and maintenance of strategy use.

Table 12. Achievement data Nancy—Writing assignments for E.C.E. courses.

	Pretest	Assign. #1 *	Assign. #2	Assign. #3	Assign. #4	Assign. #5	Assign. #6 *	Assign. #7
Thematic Salience	1	5	3	5	4	4	4	3
Organization	2	5	4	3	3	4	4	4
Idea Flow	3	3	3	4	4	3.5	4	3
Clarity	3	4	2	4	4	3.75	4	4
Average rating (1-5)	2.25	4.25	3.00	4.00	3.75	3.81	4.00	3.50

* Papers we worked on together from the beginning of the semester

Figure 10. Nancy's average ratings on writing assignments for E.C.E. courses.



* Papers we worked on together from the beginning of the semester

Joanne. Table 13 presents the ratings assigned to each of Joanne's writing samples, both at pretest and during the intervention. Average ratings across dimensions were calculated to represent the overall quality of each piece of writing. Because three of the letters (#3a-c) were written in a single sitting as part of an in-class exam, ratings on these three essays were averaged to construct a single exam score. Each of these letters was rated independently (see Table 13) but only the combined score is represented in the graphic portrayal of Joanne's results in Figure 11.

These data indicate that, at pretest, Joanne's writing was relatively stronger than the writing of the other two students, receiving an average rating of 3.25 out of a possible 5. Writing quality on the two letters written during training was greatly improved (average ratings of 4.50 and 5.00, respectively) relative to pretest. However, average ratings on letters #3a-c and #4 were only marginally greater than the ratings assigned at pretest (average ratings of 3.50 and 3.50, respectively). Writing samples from a subsequent semester were not available.

It is possible to argue that the writing samples collected during the intervention did not adequately represent Joanne's progress. Letters 3 and 4 were written very quickly as part of time-limited in-class exams. Joanne did not have access to her computer on which she usually wrote correspondence. Further, she was hurried and was not able to fully implement her strategies. In more ideal circumstances, Joanne may have been able to produce better pieces of writing. Consistent with this suggestion, Joanne reported dramatic improvement in the quality of her writing *on the job.* While copies of letters written for work were not available for direct inspection, during intervention #8 Joanne (J) described the improvements on her letter writing at work:

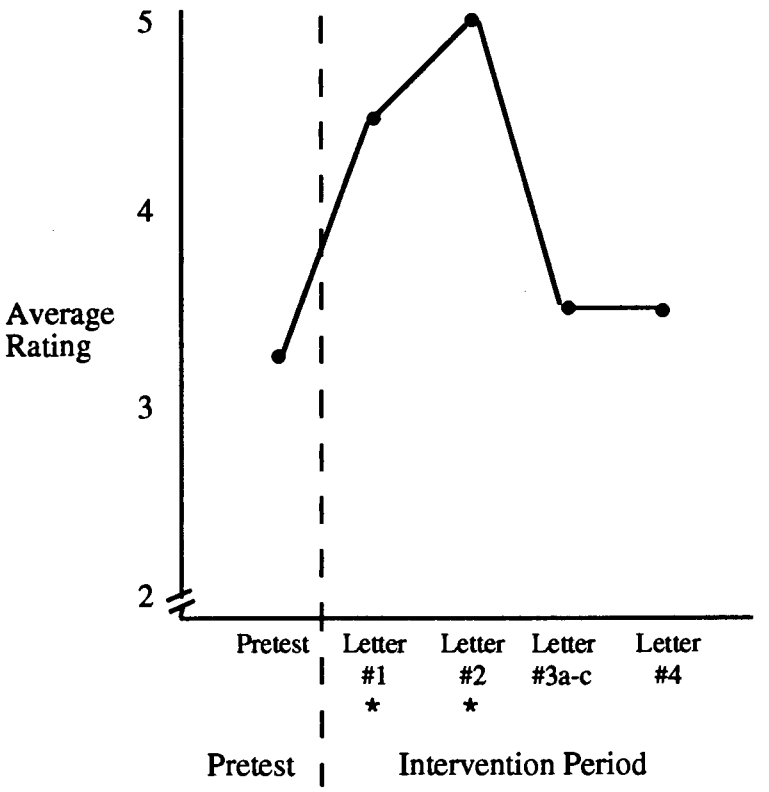
J: I do it at work all the time, like, lately, actually, from well, from what, like you've been helping me on that stuff, I can write letters now, without, like, they just tell me what they say, like, well can you write a letter to so and so about, blah, blah, blah,

Table 13. Achievement data Joanne—Writing business letters for legal secretary. course.

	Pretest	Letter #1 *	Letter #2 *	Letter #3a in-class	Letter #3b in-class	Letter #3c in-class	Letter #4 in-class
Thematic Salience	4	5	5	4	3	4	4
Organization	3	4	5	4	4	4	3
Idea Flow	3	4	5	3	3	4	4
Clarity	3	5	5	3	2	4	3
Average rating (1-5)	3.25	4.50	5.00	3.50	3.00	4.00	3.50

* Letters we worked on together from the beginning of the semester

Figure 11. Joanne's average ratings on business letters.



* Letters we worked on together from the beginning of the semester

blah, right? I can do it now, and I can, I have no problem. There's no corrections at all. They don't, the phrasing that I use, what I say, they like it.

R: Good.

J: Right, so this, that is new to me. Like, that does not happen. I never had that before. Where they'd say, "well, gee, you know, you've kind of messed it up here", so they'd rewrite it for me right? But now I just do the letters, and they're all, they're all different but they're not standard or anything like that, and they sign it right away. They have no problems with it.

R: Great.

J: So this is what I mean, this is kind of.

R: Well the thing is, so clearly you're seeing that you've made progress at work.

J: Oh yah, like, even, even like, when my mother, she, cause she's an MBA comes up there, she came up there, and I was like, oh god, oh my god. And I did this letter, and she was like really impressed, because from what she knew of all the stuff that I did, I never, I wasn't, never able to do that.

This excerpt suggests that Joanne transferred strategies to letter writing tasks in contexts other than those addressed during training.

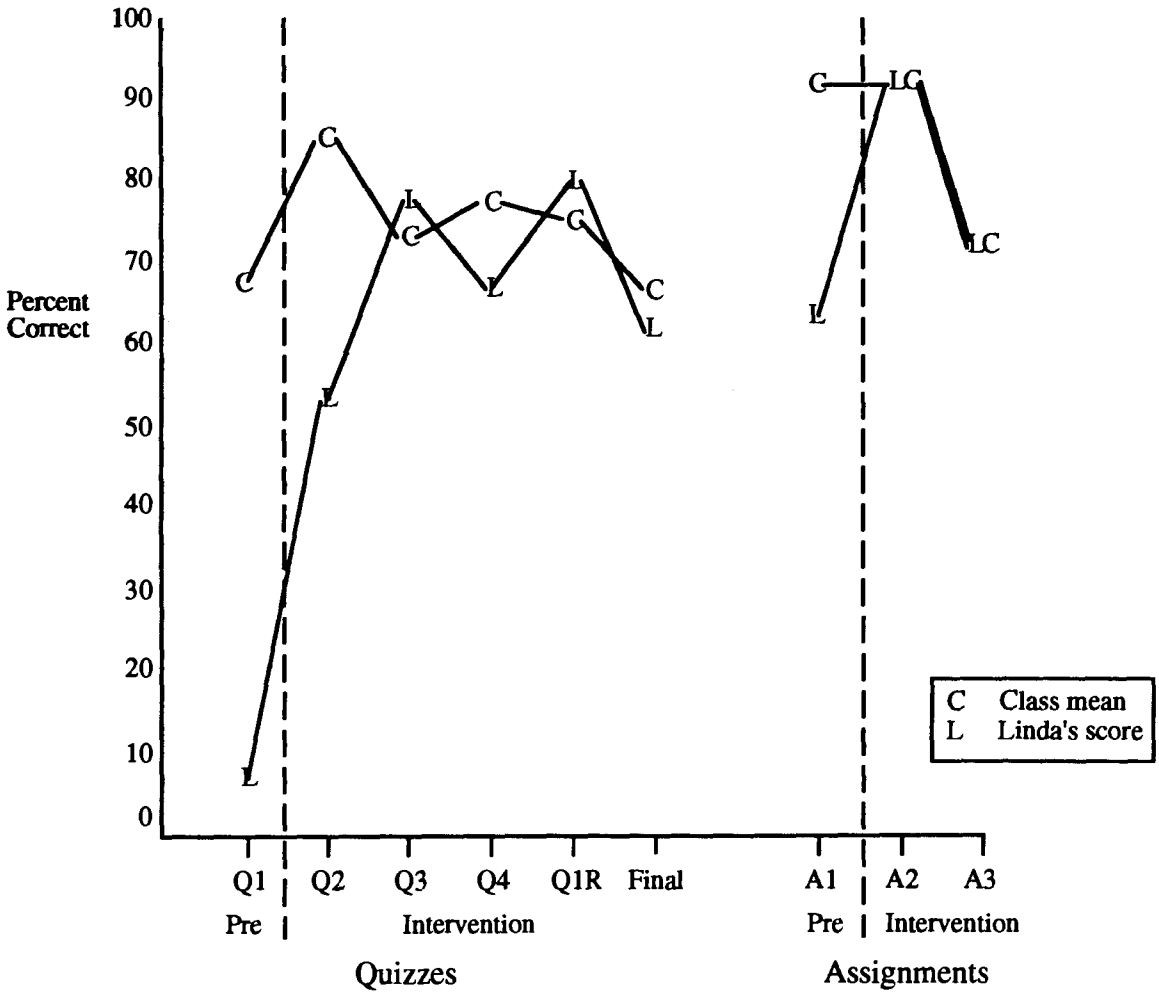
Linda. Table 14 presents Linda's scores on each of the exams and assignments completed for her statistics course during the intervention period. Also available were class means and standard deviations ($n = 19$). To facilitate interpretation of Linda's scores relative to the class mean, her scores were transformed into z-scores. Class means, standard deviations, and z-score equivalents are also presented in Table 14. Linda's scores and class means are depicted separately for quizzes and assignments in Figure 12.

Linda had completed one quiz prior to the intervention period. Her score on this quiz was roughly 8%, relative to a class mean of 68% ($z = -2.17$). During the intervention, Linda's quiz scores moved progressively closer to the class mean. On

Table 14. Achievement data Linda—Solving math problems.

	Exams						Assignments		
	Q1	Q2	Q3	Q4	Q1 redo	Final	A1	A2	A3
Linda's score (%)	8.33	53.8	78.6	66.7	80	61.4	64	91.7	71.6
Class Mean (%)	67.98	85	74.4	77.9	74.6	66.4	90.9	92	71.1
Class SD	27.54	14.4	23.6	11.1	20.9	13.6	10.4	7.3	9.2
z score	-2.17	-2.17	0.18	-1.01	0.26	-0.37	-2.59	-0.04	0.05

Figure 12. Linda's achievement data relative to the class average (n=19).



quizzes 2, 3, and 4 she scored 54%, 79%, and 67% relative to class means of 85%, 74%, and 78% (z-scores of -2.17, .18, and -1.01, respectively). At the end of the semester, Linda took an alternate, parallel version of quiz #1. On this quiz (Q1R), she scored 80% relative to a class mean of 75% (z = .26). On the final exam, Linda answered 61% of questions correctly relative to a class mean of 66% (z = -.37). Linda's assignment marks paralleled improvements in quiz scores. On her first assignment, Linda answered 64% of questions correctly relative to a class mean of 91% (z = -2.59). Subsequently, her scores on assignments 2 and 3 were very close to the class mean (z = -.04, z = .05, respectively).

These data indicate that, relative to pretest, Linda's scores improved over the course of the intervention. The only quiz on which Linda's performance fell significantly below that of her peers was quiz #4 (z = -1.01). However, additional evidence suggests that this lower score was the result of a mechanical error and that on this quiz Linda transferred the strategy to solving unfamiliar problems on material she had mastered independently. The source of this evidence was an e-mail message sent to me by the student after receiving her mark on the quiz. The text of the message is presented in Figure 13.

In general, task performance data suggest that Linda independently employed both her concept building and problem solving strategies across contexts. First, when developing Linda's strategy for mastering math concepts, only a subset of the concepts tested on quizzes 1 to 3 were jointly discussed by Linda and the instructor. Linda's improved performance on additional content provides evidence of Linda's independent mastery of relatively sophisticated statistical concepts (e.g., orthogonal contrasts). Further, while increases in exam performance in part reflect increased understanding of math concepts, improvements can also be associated with the independent employment of more effective problem solving strategies. Finally, because none of Linda's assignments were discussed during the intervention, improved marks on these assignments suggest transfer of strategy use to those tasks.

Figure 13. E-mail message from Linda explaining her results on quiz #4.

Date: Wed, 2 Dec 92 15:26:49 PST
From:
To: dbutler@sfu.ca
Subject: Errrrmmmmm....

Debbie, Hallo !

This is just to let you know what happened in my stats test this morning.... as I was rather excited when I got the result, so thought I would let you know by e-mail

....I only got 10/15....

BUT the best bit is, that the other parts of the question, I were bits the prof hardly dwelt on in class: orthogonal contrasts and effects of correlation on the different levels in the ANOVA table. I managed to work them out ! Increadable ! I am actually starting to think things out rather than panicking. (I didn't panick at all in this test - just felt ill from the cold I still have !).
So, to sum up the waffle, although I made a stupid mistake again by not being carefull enough to check what I thought was right, I managed to work out unfamiliar problems, which is progress - especially when others in the class (who ususally get top grades as well as someone I know who struggles) did not know what to do with the question.

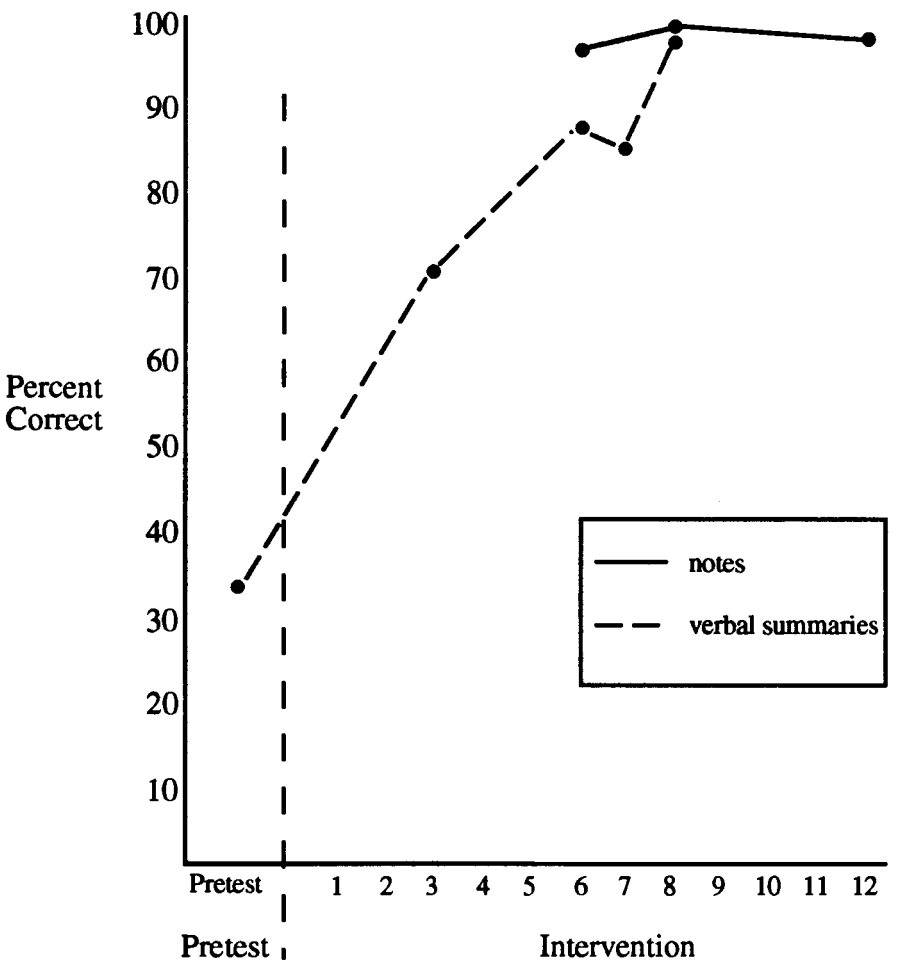
So there you go ! Just thought I would let you know how excited I was getting over stats - never thought I could say that...

Kathy. Table 15 presents data from Kathy's oral and written summaries of passages. Reported are the percentage of ideas summarized correctly out of the number of ideas summarized. These results are presented graphically in Figure 14. At pretest, Kathy summarized only 34% of ideas correctly. This improved to 71%, 88%, 86%, and 99% during interventions 3, 6, 7, and 8 respectively. Also, notes collected based on readings done outside of the intervention context showed good comprehension. Kathy summarized 97%, 100%, and 98% of the ideas correctly. These data suggest that Kathy's

Table 15. Achievement data Kathy—Percent of ideas summed correctly out of the number of ideas summed.

	Pretest	Intervention #3	Intervention #6	Intervention #7	Intervention #8	Intervention #12
Verbal Summaries (%)	17/50 (34%)	17/24 (71%)	42/48 (88%)	25/29 (86%)	67/68 (99%)	-
Notes (%)	-	-	32/33 (97%)	-	21/21 (100%)	115/117 (98%)

Figure 14. Achievement data Kathy—Percent of ideas correctly summed.



reading comprehension improved over the course of the intervention and that this improvement extended to reading completed outside of the intervention context. Improvement of comprehension is also suggested by Kathy's course grades. Prior to the intervention Kathy wrote one midterm exam, which she failed. After the intervention she did well enough on an oral presentation of an article (summarized in her notes from intervention 12) and on her final exam to pass the course.

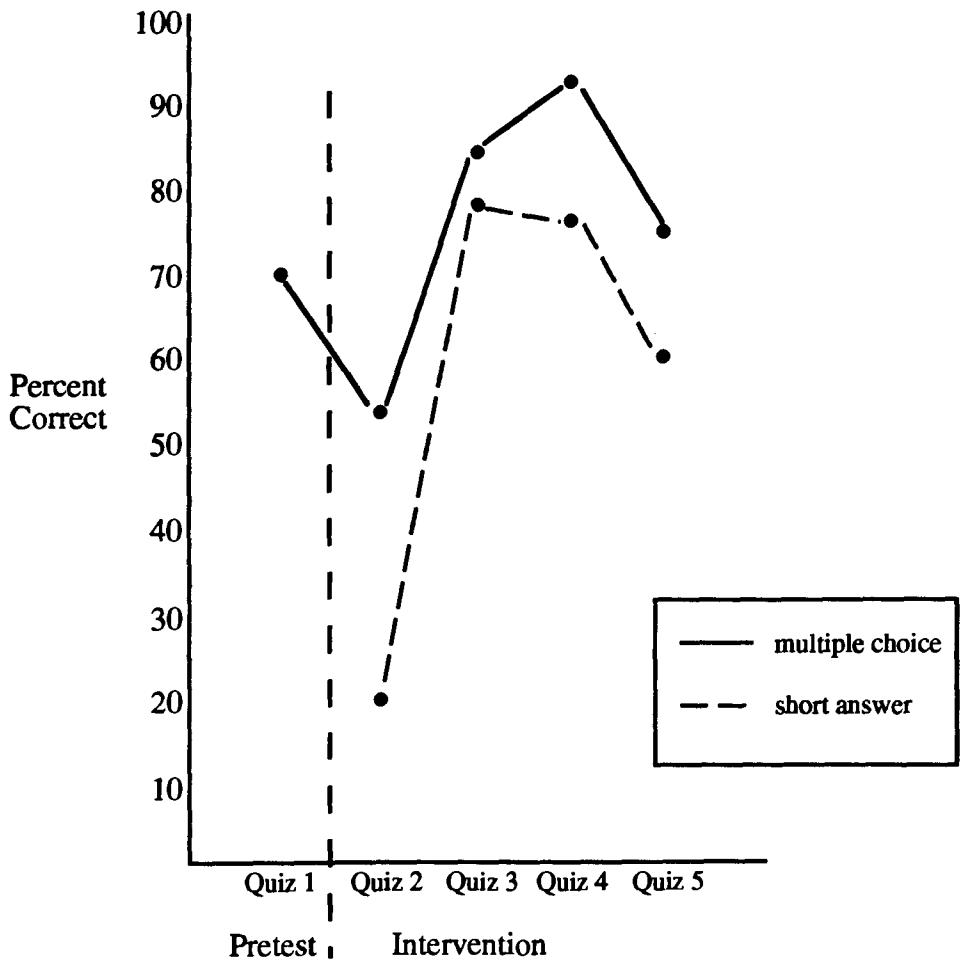
Mike. Table 16 presents Mike's scores on quizzes completed during the intervention period. Raw scores and the percentage of questions answered correctly are reported for each quiz as a whole, and for recall (short answer) and recognition (multiple choice) items separately. The percent correct for recall and recognition items are presented graphically in Figure 15.

These data indicate that Mike's task performance improved over the course of the intervention. On the pretest, Mike did relatively well on the multiple-choice, recognition items (70% correct) but struggled with one short answer recall question. On quiz 2, Mike correctly answered only 20% of recall and 54% of recognition items. Mike took the quiz a second time, to help build his confidence once he and the researcher had developed initial strategies. As would be expected (given that Mike answered the same questions twice), Mike did much better the second time (73% and 90% on recall and recognition items respectively). While data from quiz 2 retake is summarized in Table 16, because it was taken twice, it is not included in the graph of Mike's progress. On quizzes 3 and 4, Mike's performance on short answer questions increased to 79 and 77%, respectively, while his responses to recognition items increased from 83 to 91%. Finally, on his last quiz, Mike's performance dropped to 60% on recall and 75% on recognition items. This quiz was written during Mike's final exam period when presumably the demands of his actual courses may have competed for his attention. Nonetheless, his score on recall items remained above pretest on this quiz.

Table 16. Achievement data Mike—Responding to short answer and multiple choice test items based on reading.

	Quiz 1	Quiz 2	Quiz 2 retake	Quiz 3	Quiz 4	Quiz 5
Short Answer Questions (%)	1/2 (50%)	2/10 (20%)	9/10 (90%)	9.50/12 (79%)	8.5/11 (77%)	6/10 (60%)
Multiple Choice Questions (%)	7/10 (70%)	4.33/8 (54%)	5.83/8 (73%)	8.33/10 (83%)	10/11 (91%)	7.5/10 (75%)
Total (%)	8/12 (67%)	6.33/18 (35%)	14.83/18 (82%)	17.83/22 (81%)	18.5/22 (84%)	14.5/20 (73%)

Figure 15. Mike's scores on short answer and multiple choice questions.



Again, because Mike was not taking a course which required learning and studying from textbooks during the intervention period, he did not have the opportunity to demonstrate transfer on this task. However, Mike reported that, by adapting his strategies to assist him in his actual math and English coursework, his task performance in those contexts improved. Qualitative evidence of Mike's strategy transfer and improved task performance across tasks is presented in the next section.

In this section evidence for the progress of each participant has been presented separately. Inspection of performance data across students suggests certain common effects. First, all students demonstrated improvement in task performance on training tasks. Second, for at least 5 out of 6 students, performance improvements extended to similar tasks across contexts. Finally, at least 2 students maintained performance improvements into a subsequent semester. Taken together, the analyses of students' strategy use described in the last section and the performance data presented here suggest that students transferred and maintained strategies, resulting in improved task performance across contexts and over time. Of particular interest is the fact that the SCL approach is associated with performance gains for students working on a range of qualitatively different tasks, including reading, writing, and math.

Did students transfer strategic processing to different tasks and demonstrate improved performance on those tasks?

The data on strategy use and task performance reported so far support the conclusion that the SCL intervention promoted transfer to *similar* tasks across contexts. In this section, evidence is presented which indicates that students may have developed a disposition to attack *different* tasks strategically as well. In order to examine data related to this question, field notes and transcripts were reviewed. Excerpts from interactions where students reported spontaneous transfer of strategies to different tasks were systematically extracted and tabulated. These excerpts are presented for inspection in Appendix 4.

These data reveal that five out of six students reported adapting their strategies for use in different tasks. For example, Jennifer, who developed a strategy for *writing*, commented in her posttest session that her strategy helped her in when *taking notes* during lectures: "It's helped me in my note taking too, just helped me pick out, like, because I'm so concentrating on flow, I can pick up on other people's flow now. So like, you know, the teacher's going on, I no longer write down like, scribbling madly about every single point he makes, but I can almost summarize and just, it's getting, my essay writing, my note-taking is better now." Kathy, who had been working on a strategy for *reading*, also commented that recognizing the flow of an argument made it easier for her to comprehend lectures. The data also suggest that these students may have transferred strategy use across communication tasks because they recognized common goals and the benefit of strategies in achieving them. As Jennifer implies above, by concentrating so much on flow in writing, she came to recognize flow within writing and listening tasks.

Similarly, Joanne, who was developing a strategy for *writing* business letters, suggested in the sixth intervention meeting that the strategy had helped her *transcribe* letters at work: "So it does help, doing the strategy for the letters, knowing how to do a letter, and listening to someone else do a letter—it all falls into place easier."

Linda (L) reported applying the concept building strategy she developed to study math when she was reading articles in preparation for her thesis:

L: This strategy of targeting with this, is transferring. I mean, I haven't hardly done anything else, except, stats. And I've been doing all my testing for my pilot work. But now I'm actually getting into doing my analysis, and I've actually had to get on with my own reading. And having to put this presentation together. But I found myself this morning and last night going in and just whipping through the papers and focusing straight in to try and pull out exactly what I wanted. So I'm, you know, it's great.

R: Would you have done that before?

L: Um, no, not as efficiently.

R: Oh, good.

L: Yah, so it's good. Because, I'm reading journals. I'm, you know, sort of sit there and spend hours and then make notes and exactly the same as what I was doing with the stats. And not pulling out, just the main points which I needed, and, OK, so there's loads of other points, but it, they're not important at the moment, you know, I can always go back to those. So, that's great, because I mean it's, it means that all my work's becoming more efficient. Which is good.

R: That's excellent.

L: It should save me a lot of time. So I can go out and party more now.

Finally, over a series of intervention sessions, Mike described how he adapted his reading and studying strategies within his math and English courses. As early as intervention #4, he noted, "And, I'm reading, well, for my English right? I'm reading it and I'm understanding it a lot better, cause I'm reading each paragraph at a time too, for my courses." A bit later he continued, "I'm even doing that with my math even, right? Cause with the explanation of, when they're, in the beginning? They show a whole introductory of what's going to be taught, or, before you do your exercises, right? So you read it, and, that's what I'm doing, is I'm reading each one of them, and then I'm doing the margin questions, right?".

In the seventh intervention meeting, Mike (M) described how his reading strategy was helping him in his paragraph *writing*. He too recognized the common goals across communication tasks:

M: Like, remember we were saying, that, there's always going to be a sentence that's going to be describing what they're going to be talking about? And um, that's what I'm doing right now. I'm going to say, OK, this is what I'm going to be talking about.

And then I would start, I would say, OK, these are the three steps, or four steps or whatever, right?

R: Good

M: And that's why, that's how I, I kind of interrelate with that, with this, right? Cause, this was the same thing, but in essay form, in a way, right?

During subsequent sessions, Mike continued to describe how his strategies helped him in math, and directly linked strategy use to improvements in performance. During intervention #11 he remarked: "Yah, cause I mean, look how well I'm doing right now in my math, right? I'm getting about 100% on stuff." Later, in the posttest session, he explained:

M: But you know, I applied my methods also to my, like, remember I was telling you I applied my methods, to my, for my work too? My school work? And I could see, I saw the results right? In my math, algebra, I had, in my grade 10, I had two B's right, ... So, like the first section I did for grade 11, I received a B. And the second, after we started meeting and doing our processing stuff, I received an A for my final grade.

R: Good. So you

M: So I mean, I guess I progressed right there, right?

R: Um huh, that's good. And why do you think that happened?

M: Well, just from the studying methods I was um, I put towards my studying.

In the end, Mike was very pleased with the impact on his math performance: "Well, yah, I mean that's, that was really, I was like shocked right? I've never received that high of a mark, ever, you know. That's pretty good. 95%, I'm going why, that's only 5% lower than 100%."

The evidence presented in this section suggest that 5 out of the 6 participants in this study applied strategies to different tasks with similar goals. In essence, they began to approach a range of tasks in a more problem solving and strategic manner.

Did students demonstrate increased metacognitive awareness about tasks and strategies over the course of the intervention?

A central question in this study was whether students' metacognitive awareness about tasks and strategies increased following the intervention. Two types of data are summarized pertaining to this question. First, students' scores on the metacognitive questionnaire are described. Second, analyses of data extracted from students' oral responses to the attribution/strategy interview are reported. Each of these measures provide evidence of improvements from pre- to posttesting in students' understanding about tasks and strategies.

Because of the small sample size (n = 6) in this study, the central tendency in pre-post data across participants is summarized using medians rather than means and variability is described with minimum and maximum ratings. Hypotheses were examined using the Wilcoxon non-parametric test for dependent samples. This procedure was selected because it provided a more sensitive measure of pre-post differences than did parallel non-parametric tests (e.g., the Sign test). Medians, minimum-maximum scores, and the results from the Wilcoxon comparisons from both the metacognitive questionnaire and the attribution/strategy interview are reported in Table 17.

These data indicate that students' metacognitive awareness about tasks and strategies improved from pre- to posttesting. Specifically, the median score across students on the metacognitive questionnaire increased from 2.25 at pretest to 2.92 at posttest ($Z = 1.99$, $p < .03$, one-tailed). The median score assigned to oral descriptions from the attribution/strategy interview increased from 2.25 at pretest to a ceiling of 3.00

Table 17. Pre-post differences in metacognitive awareness.

		Metacognitive Questionnaire	Metacognition from the Attribution/Strategy Interview
Pretest	Median (min-max)	2.25 (1.33 to 3)	2.25 (2 to 3)
Posttest	Median (min-max)	2.92 (2.83 to 3)	3.00 (3 to 3)
Wilcoxon test		Z = -1.99 p < .03*	Z = -2.02 p < .02*
Scale		1-3	1-3

at posttest (Z = -2.02, p < .02, one-tailed). There was no overlap between the distributions for the attribution/strategy interview scores. Based on these analyses it is possible to conclude that both students' written and oral descriptions of tasks and strategies reflected greater metacognitive awareness at posttesting than at pretesting.

Further analyses of data derived from the attribution/strategy interview elaborate the quantitative findings. These analyses suggest that while one student's task and strategy descriptions already reflected metacognitive awareness at pretest (each description received the maximum rating of 3), 5 out of the 6 students improved in their descriptions of tasks, strategies, or both. First, several students' descriptions of tasks improved from pre- to posttesting. This is critical because, if self-regulated and strategic learning is in essence a problem solving activity where students engage strategies to achieve identified goals, then pursuing inappropriate goals can undermine learning efforts regardless of strategies employed. For example, neither Kathy nor Mike clearly recognized that the goal of reading was to identify main ideas and to reconstruct the flow of an author's argument. Kathy assumed her reading difficulties were a function of a specific word-retrieval memory problem. She characterized reading as the process of recognizing individual words and building those words into sentences. This in part accounted for her

overuse of dictionaries when reading even simple passages. Mike recognized that his goal was to pull out important information but also focused on perception of individual words as his major problem in reading.

On posttests, both Mike and Kathy (K) described the goals of reading more accurately. Mike described how he used the strategy to figure out what the author was trying to say and to make connections between ideas within a text:

R: So is there any particular method you use to read and study from textbooks, now?

M: I guess I just said it right there, in a way. I, I read it from what it's trying to say. And, and I say, OK, well this is what they're going to be talking about. For the first little part they're going to be saying, OK, well they're going to be saying this, and talking about the cortex, right? and the different, the different, different systems of the cortex, right? So, OK, well that's what I'm expecting. So they're going to go in further detail on that, right?

R: Right, OK. And then, what, I know you described some of it before

M: And then I would like, I would say, OK, well, yah, this is what they are talking about, I would make a connection with everything, right? I'd say, OK, well this is the connection and everything.

Kathy described how she used her strategy to achieve task goals:

K: When I approach a reading task, I now use, will, try to use time management, and divide my task into chunks rather than a whole chunk. Then I use my, the strategy I develop, developed. First, to understand what my goals, right now I'm rehearsing my goals continually, just so they're very strongly set in me. And then I use my strategy in a flexible way, so that I can accom- retrieve the main idea.

Linda was another student who improved in her understanding of what she was supposed to be doing when learning math. Her perception at pretest was that solving math problems involved recognizing the correct formula to apply to a certain type of problem:

L: Yah, I mean I look at it and try different methods, but if I can't do it straight off, if I don't recognize it and can't do it straight off, then I find it quite hard, even if I do try different things, or try to apply different methods, I can't get round it. I find it quite difficult to solve.

At posttest, she recognized that her task was to build conceptual knowledge in math and to represent problems in terms of her understanding in order to derive a solution method. In the following excerpt, Linda accounts for her problem solving success in terms of her understanding of the concepts behind the question:

L: That's the major reason, yah. I was, but understanding what the question was asking so that I could work it out, understand what was involved, because when I can't work things out it's because I don't know what the question's getting at, or what it's trying to ask.

Later in the final interview, she described what she had gained by participating in the study:

L: I've gained a huge amount. It's shown me, it's shown me how to, well, you've shown me how to, approach- it's shown me a totally different approach to, to math. And, so that I can, it's sort of broken it down, because I was always trying to rush through, expecting to pick things up and be able to solve questions straight off. But to actually

go back and take time to understand what's going on, and why it is going on, rather than just cut and paste and put the numbers into an equation and expect things to work. So now, I've got a much better, I've got all these strategies I can use. And, to actually understand the concepts involved with the material I've been covering, and, which I can do on my own, now...

The three writing students each recognized at pretest that their task was to construct a targeted, organized, flowing piece of writing. Joanne already had the outline of a strategy which she and the researcher elaborated during training. However, both Jennifer and Nancy were unsure of how to achieve that goal. Over the course of the intervention, each of these students increased in metacognitive awareness of strategies. Similarly, in addition to improving their understanding of tasks, analyses of students' strategy descriptions suggest that Mike, Kathy, and Linda also improved in their metacognitive awareness of strategies. A summary of students' reported strategy use at pre- and posttesting from the attribution/strategy interview is presented for review in Appendix 5.

As a single example of students' changes in strategy awareness over time, consider first Nancy's (N) pretest description of her approach:

R: Alright good. OK, my, this is my last question, see this is easy. Um, is there any particular method you use now to write a paper?

N: Um, is there any particular method? Well, I haven't really used it yet, but I've had methods, people, like Sherry and I were talking about methods, but I haven't really used them yet, but the method I basically use, is just, whatever brainstorming's in my mind, I just start writing it down. I don't even write it in point form. And, the reason I don't do that, I should, but I feel, if I write it in point form, and I have all these point forms, and I want to use them all, and you can't really use them all in there a lot of times, and that's what I try to do, and it just frustrates me more, so I just, blank. Just,

freestyle writing, just, whatever flows through my mind, and I don't know if that's, I don't think that works very well for me either, because like I said, all my thoughts go down on paper all together at once.

At posttest, Nancy's response to the same question reflects her increased awareness of and understanding about strategies:

R: OK, good. The next question is, is there any particular method you use to write a paper or an essay?

N: Is there? Yes there is. And I have it written down. And my method is, first I start from gathering information. And it's just point form information. Whatever topics, I'll just grab books and so forth, I'll just gather all information from whatever sources I need to, on whatever topic I need to write at. From there, from gathering the information, I'll try to break my information down, into sections. In other words, topic, my introduction, my body, and my conclusion. And I'll take from all my information, I'll break down what I want to put into each section.

R: Um huh.

N: And from there I start to write it into paragraph forms, what, from the introduction, what I took, from my notes, I'll take into my, into my first rough draft. And I'll start writing on the introduction part. And from there, I'll take whatever I wrote on my body, that I thought I was going to add into my body, and I'll start breaking that down and writing on that, I'll do a paragraph on each. And the conclusion the same thing. And then from there, I'll do a second draft, where I'll try to get that all to flow smoothly. I'll take my para, what I wrote in my paragraph, what I wrote in the body, and conclusion, and I put that all together. And then from there, I do another final draft, which is to, reorganize my writing, my sentence structures and so forth. Yah.

Note that in this study students' reported strategy use closely matched methods actually employed. This may have been because students described the strategies prior to implementing them. That participants fairly accurately described the strategies (or lack thereof) actually used can be observed by comparing the reported strategies presented in Appendix 5 to the observed strategies described in Appendix 6.

In sum, the analyses described in this section confirm that students generally increased in their metacognitive awareness of both tasks and strategies over the course of the intervention.

Did students' perceptions of self-efficacy increase over the course of the intervention?

Changes in students' perceptions of self-efficacy were assessed using data from three sources. These sources were students' responses to the self-efficacy questionnaire on pre- and posttests, students' ratings of competence on question #5 of the metacognitive questionnaire on pre- and posttests, and students' perceptions of gains achieved as described in responses to the final interview.

Three scores were calculated for each student based on responses to the self-efficacy questionnaire. The average rating assigned to questions 1 to 10 reflected a student's perception of competence. The average rating assigned to questions 11 to 16 reflected a student's task preference. Finally, the average of responses to all 16 questions provided an overall measure of self-efficacy. Parallel to analyses on the metacognitive data, medians, minimum-maximum ratings, and the results from the Wilcoxon test of pre-post differences for the three measures of self-efficacy are presented in Table 18.

These analyses suggest that students' perceptions of competence, preferences for their chosen task, and overall self-efficacy each improved from pre- to posttesting (all p's $< .02$, one-tailed). Further, inspection of the minimum and maximum ratings at pre- and posttesting reveal that there was little overlap between the distributions of scores at pretest and posttest for students' perceptions of competence and no overlap between the

Table 18. Pre-post differences in perceptions of self-efficacy.

	Perceptions of Competence (Q# 1-10)	Task Preference (Q# 11-16)	Self-Efficacy Questionnaire (Total)	Rating of Ability on Task from the Metacognitive Questionnaire
Pretest Median (min-max)	1.70 (1.40 to 2.60)	2.33 (1.50 to 4.00)	2.00 (1.50 to 2.63)	2.00 (1 to 3)
Posttest Median (min-max)	3.35 (2.30 to 4.00)	4.00 (2.67 to 4.50)	3.53 (2.94 to 4.19)	3.00 (3 to 4)
Wilcoxon test	$Z = -2.20$ $p < .02$*	$Z = -2.02$ $p < .02$*	$Z = -2.20$ $p < .02$*	$Z = -2.20$ $p < .02$*
Scale	1-5	1-5	1-5	1-5

distributions on the overall measure of self-efficacy. Thus, data from the self-efficacy questionnaire suggest a significant improvement in perceptions of self-efficacy from pre- to posttesting.

Data from question 5 on the metacognitive questionnaire support this conclusion. On this single item, students' median rating improved from 2.00 at pretest to 3.00 at posttest ($Z = -2.20$, $p < .02$, one-tailed). Again, distributions at pre- and posttesting failed to overlap.

A final source of data substantiating gains in self-efficacy were students' responses to the final interview. Students' responses to each question in the final interview were categorized in terms of the improvements perceived by students. These data indicate that 5 out of the 6 students described gains in confidence or competence. For example, Jennifer stated, "And then just the marks are a lot different. That, I feel like, you know, like, when you're walking around the class and we're getting our essays back, my marks are average or above average. So I feel better about it. Like, I don't feel like I'm such a dunce."

Did students' patterns of causal attributions shift over the course of the intervention?

Data pertaining to students' causal attributions for successful and unsuccessful performance were derived both from students' ratings of ten different factors on the attribution questionnaire and students' unstructured responses to the attribution/strategy interview. Data from these two sources will be reported in turn.

First, during pre- and posttesting, each student rated the influence of ten factors, six internal (ability, effort, strategy use, motivation, mood and interest) and four external (setting, luck, task ease, and help) on both good and poor performance. Table 19 summarizes students' causal attributions for success, while Table 20 summarizes their attributions for failure. Consistent with previous analyses, medians and minimum-maximum scores are reported for ratings at both pre- and posttesting as are the results of Wilcoxon tests of the significance of pre- to posttest differences for each factor.

Consider first students' attributions for successful performance. Results indicate that attributions to five out of six internal factors were significantly higher at posttest than at pretest, while attributions to one out of the four external factors was lower at posttest than at pretest. Specifically, at posttest students were more likely to credit success to their ability on the task ($Z = -2.02$, $p < .05$, one-tailed), the amount of effort expended ($Z = -2.20$, $p < .01$, one-tailed), strategy use ($Z = -2.20$, $p < .01$, one-tailed), motivation ($Z = -1.83$, $p < .05$, one-tailed), and/or mood ($Z = -1.83$, $p < .05$, one-tailed). On the other hand, the help from others was perceived to be less influential at posttest ($Z = -1.83$, $p < .05$, one-tailed). Analyses on ratings for poor performance revealed two significant differences. Specifically, at posttest students were less likely to attribute poor performance to a lack of ability ($Z = -2.20$, $p < .01$, one-tailed) or to task difficulty (ease) ($Z = -2.02$, $p < .05$, one-tailed). To facilitate interpretation of these data, median post-pre difference scores were calculated. These difference scores are summarized in Tables 19 and 20 and are graphically depicted in Figures 16 and 17.

Table 19. Median causal attribution ratings for good performance at pre- and posttesting across 10 dimensions.

	Ability	Effort	Strat.	Mot.	Mood	Interest	Setting	Luck	Ease	Help
Pretest										
Median	1.00	3.00	3.50	3.00	1.50	4.00	2.00	1.50	3.00	3.50
min-max	1 to 2	1 to 4	1 to 4	3 to 5	1 to 3	2 to 5	1 to 5	1 to 4	2 to 5	1 to 4
Posttest										
Median	3.50	5.00	5.00	4.50	3.50	3.50	3.50	1.50	2.50	2.00
min-max	1 to 4	4 to 5	5 to 5	4 to 5	1 to 5	3 to 5	3 to 4	1 to 2	1 to 5	1 to 4
Post-Pre										
Median	2.00	2.00	1.50	1.00	1.00	0.00	1.00	-0.50	-0.50	-1.00
min-max	0 to 3	1 to 4	1 to 4	0 to 2	0 to 4	-1 to 1	-2 to 3	-2 to 1	-4 to 2	-2 to 0
Wilcoxon Z=	-2.02*	-2.20**	-2.20**	-1.83*	-1.83*	n.s.	n.s.	n.s.	n.s.	-1.83*

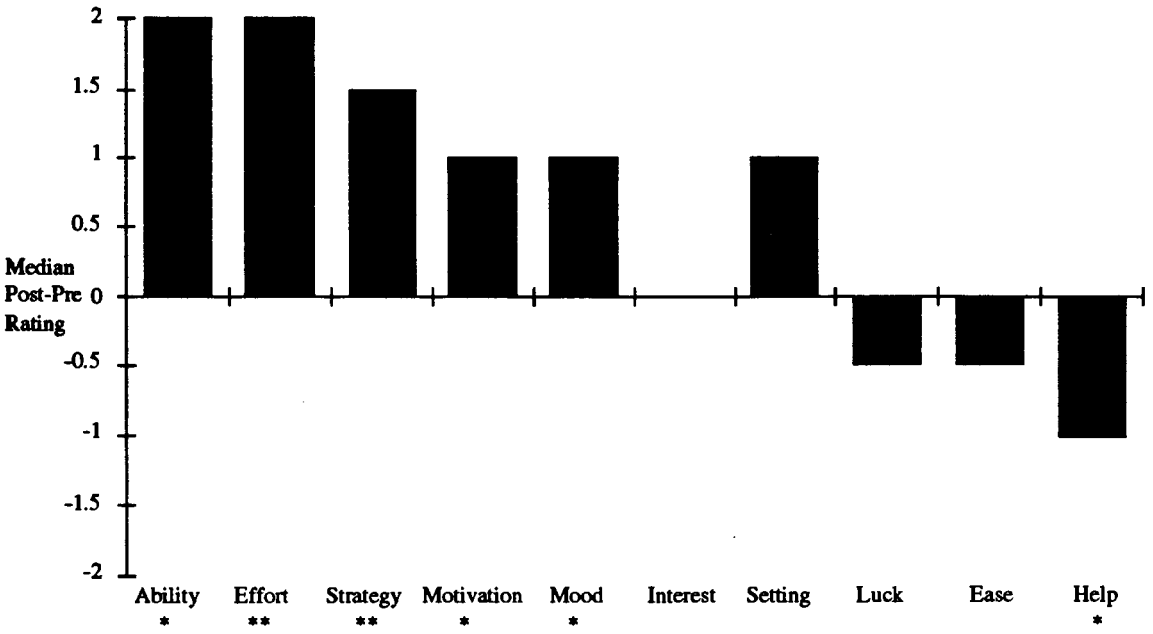
* $p < .05$ ** $p < .01$ one-tailed

Table 20. Median causal attribution ratings for poor performance at pre- and posttesting across 10 dimensions.

	Ability	Effort	Strat.	Mot.	Mood	Interest	Setting	Luck	Ease	Help
Pretest										
Median	5.00	2.50	4.00	3.00	1.00	3.50	1.00	1.00	4.50	2.50
min-max	3 to 5	1 to 3	1 to 5	1 to 4	1 to 3	1 to 5	1 to 4	1 to 3	1 to 5	1 to 4
Posttest										
Median	2.50	3.00	5.00	2.50	2.50	2.50	2.00	1.00	2.50	1.00
min-max	1 to 3	1 to 5	3 to 5	1 to 4	1 to 4	1 to 4	1 to 4	1 to 2	1 to 3	1 to 4
Post-Pre										
Median	-2.00	0.50	0.50	-0.50	0.00	-0.50	0.00	0.00	-2.00	-0.50
min-max	-4 to -1	-1 to 2	-1 to 4	-3 to 2	-1 to 3	-3 to 0	-3 to 3	-1 to 1	-3 to 0	-2 to 1
Wilcoxon Z=	-2.20**	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	-2.02*	n.s.

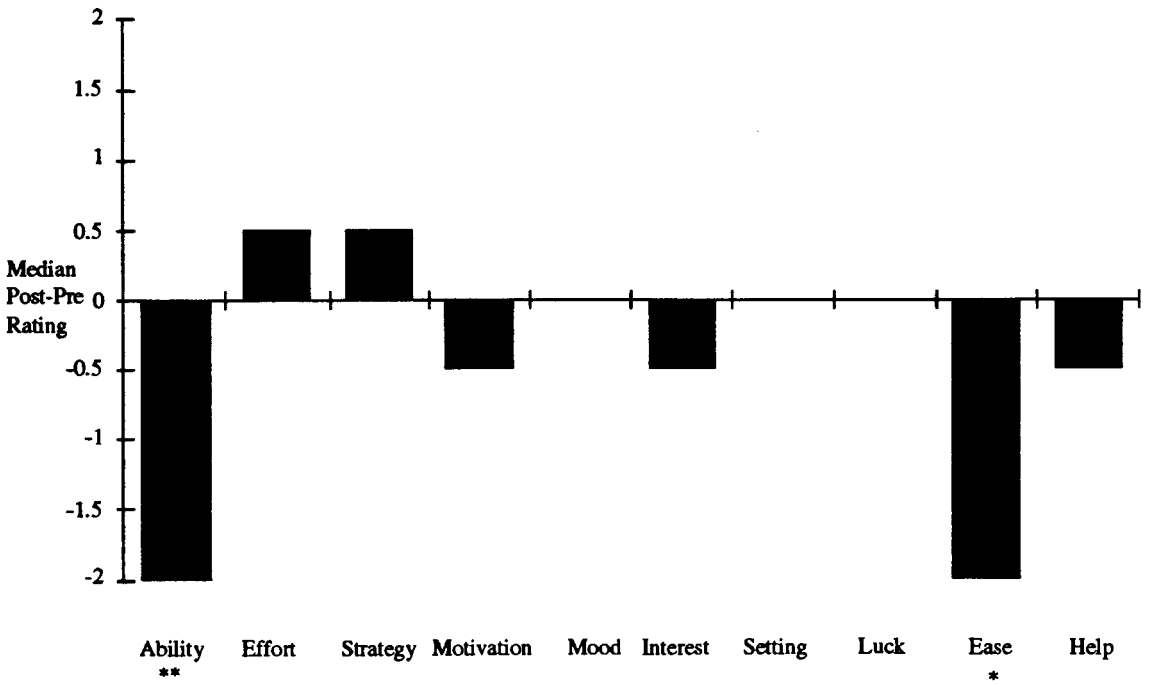
* $p < .05$ ** $p < .01$ one-tailed

Figure 16. Post-pre differences in attribution ratings for successful performance.



* p.< .05 ** p < .01 one-tailed

Figure 17. Post-pre differences in attribution ratings for poor performance.



* p < .05 ** p < .01 one-tailed

Similarly, to facilitate interpretation of changes in the patterns of students' attributions over time, Figures 18 and 19 graphically represent students pre- and posttest ratings for successful and unsuccessful performance, respectively. Internal factors are listed on the left in each graph, while external factors are listed on the right. First, for successful performance, Figure 18 illustrates the shift in students' attributions to internal, rather than external factors. The internal factors on the left consistently received significantly higher ratings at posttest than at pretest. On the other hand, external factors, on the right, were perceived to be less important.

Wilcoxon tests were also computed to evaluate the relative importance of different factors represented in this attribution profile. Pretest comparisons are presented in Table 21. Posttest comparisons are presented in Table 22. While caution should be used in interpreting these results because of the large number of comparisons, the results are at least suggestive. At pretest, students' ratings of (high) ability as a causal factor were lower than ratings to 6 out of the 9 remaining factors. Consistent with data on self-efficacy reported earlier, this suggests that students had low perceptions of competence on their chosen task at that time. At posttesting, the ratings to (high) ability were significantly greater than ability ratings at pretest, reflecting a greater sense of competence. Nonetheless, at posttest ratings given to ability were lower than ratings given to strategy use or motivation. Consistent with expectations, strategy use, motivation, and effort were the most highly rated attributions, while luck, ease and help received the lowest ratings.

Pattern changes in attributions for poor performance were not as visually distinct (see Figure 19). However, a closer examination of ratings reveals a clear pattern. Table 23 presents statistical comparisons of ratings during pretesting, while Table 24 presents posttest comparisons. Judging from the graph in Figure 19, at pretesting the factors perceived to be most responsible for poor performance were low ability and task difficulty. Wilcoxon tests confirm that ratings to low ability were significantly higher

Figure 18. Profile of attributions for successful performance at pre- and posttesting.

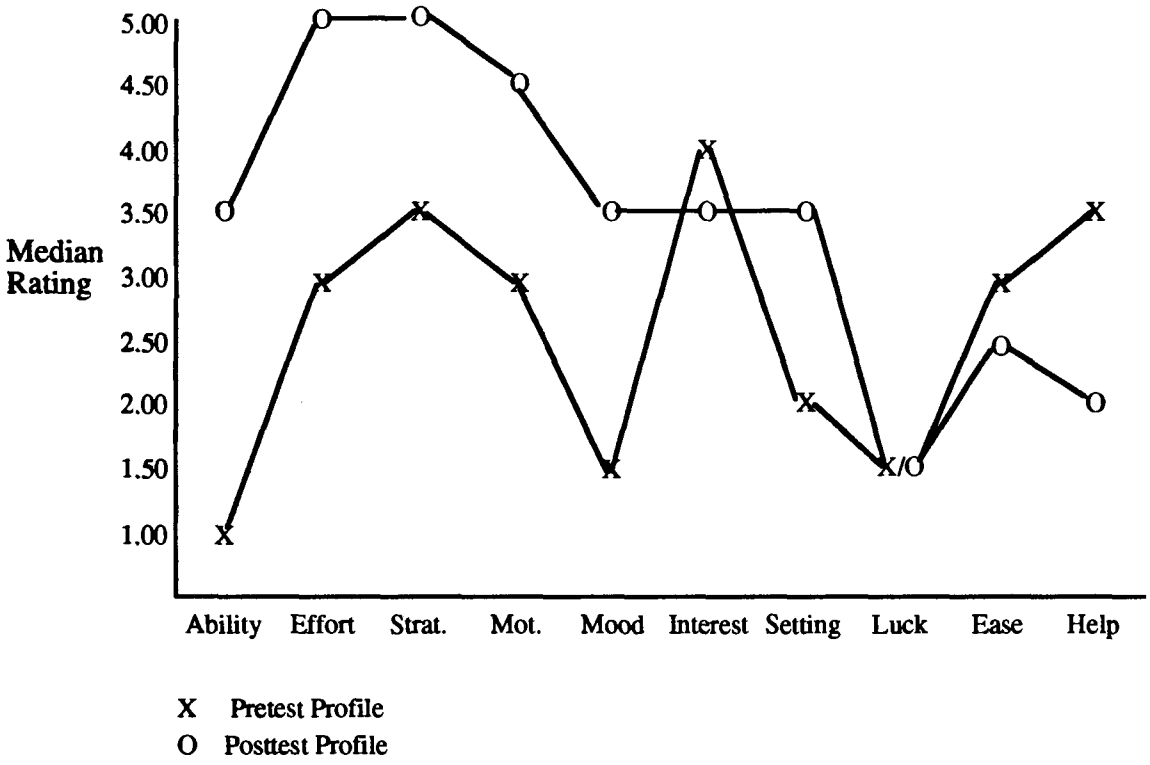


Figure 19. Profile of attributions for poor performance at pre- and posttesting.

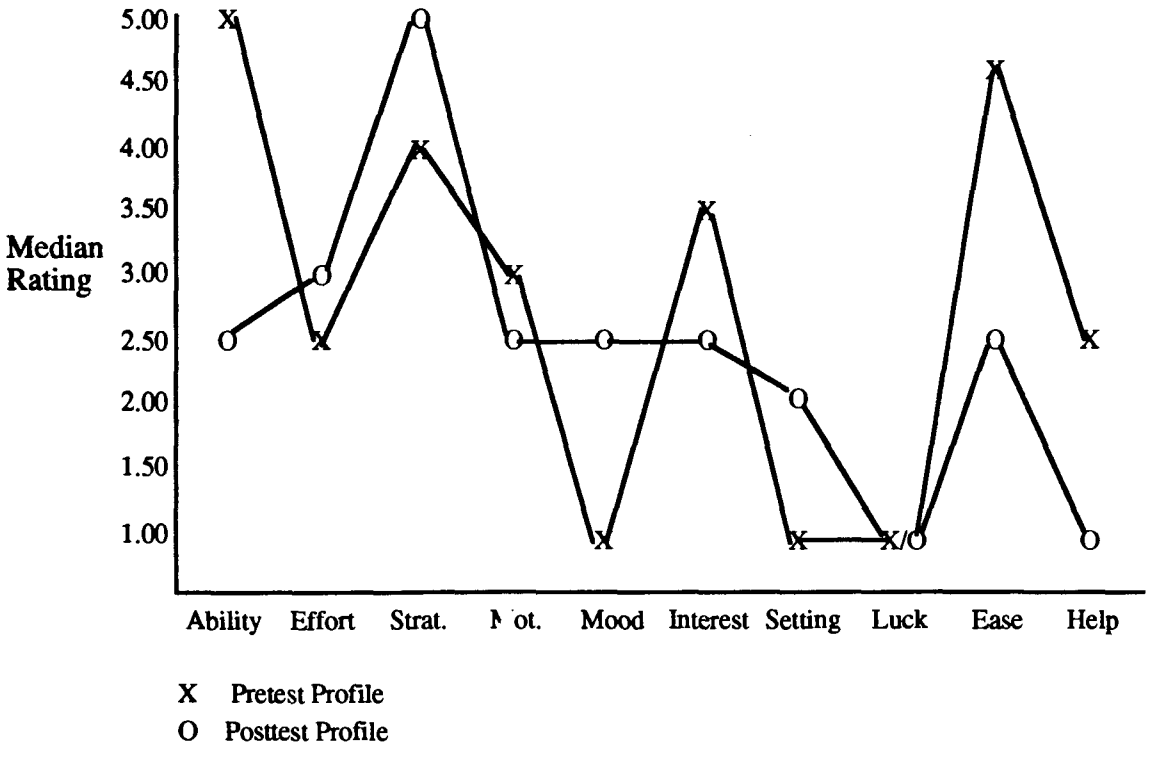


Table 21. Wilcoxon tests comparing ratings on attributions for success at pretest.

		Effort	Strat.	Mot.	Mood	Interest	Setting	Luck	Ease	Help
Ability	Z =	-2.02	-2.02	-2.2	n.s.	-2.02	n.s.	n.s.	-2.2	-2.02
	p =	0.04	0.04	0.03		0.04			0.03	0.04
Effort	Z =		n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.
	p =									
Strategy	Z =			n.s.	-2.02	n.s.	n.s.	n.s.	n.s.	n.s.
	p =				0.04					
Motivation	Z =				n.s.	n.s.	n.s.	n.s.	n.s.	n.s.
	p =									
Mood	Z =					n.s.	n.s.	n.s.	-2.02	n.s.
	p =								0.04	
Interest	Z =						n.s.	n.s.	n.s.	n.s.
	p =									
Setting	Z =							n.s.	n.s.	n.s.
	p =									
Luck	Z =								n.s.	n.s.
	p =									
Ease	Z =									n.s.
	p =									

Table 22. Wilcoxon tests comparing ratings on attributions for success at posttest.

		Effort	Strat.	Mot.	Mood	Interest	Setting	Luck	Ease	Help
Ability	Z =	-2.2	-2.2	-2.02	n.s.	n.s.	n.s.	-2.02	n.s.	n.s.
	p =	0.03	0.03	0.04				0.04		
Effort	Z =		n.s.	n.s.	-2.02	n.s.	-2.2	-2.2	-2.02	-2.2
	p =				0.04		0.03	0.03	0.04	0.03
Strategy	Z =			n.s.	-2.02	n.s.	-2.2	-2.2	-2.2	-2.2
	p =				0.04		0.03	0.03	0.04	0.03
Motivation	Z =				n.s.	n.s.	-2.02	-2.2	-2.02	-2.2
	p =						0.04	0.03	0.04	0.03
Mood	Z =					n.s.	n.s.	-2.02	n.s.	n.s.
	p =							0.04		
Interest	Z =						n.s.	-2.2	n.s.	-2.02
	p =							0.03		0.04
Setting	Z =							-2.2	n.s.	n.s.
	p =							0.03		
Luck	Z =								n.s.	n.s.
	p =									
Ease	Z =									n.s.
	p =									

Table 23. Wilcoxon tests comparing ratings on attributions for poor performance at pretest.

		Effort	Strat.	Mot.	Mood	Interest	Setting	Luck	Ease	Help
Ability	Z =	-2.2	n.s.	n.s.	-2.2	n.s.	-1.99	-2.2	n.s.	-2.2
	p =	0.03			0.03		0.05	0.03		0.03
Effort	Z =		n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.
	p =									
Strategy	Z =			n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.
	p =									
Motivation	Z =				n.s.	n.s.	n.s.	n.s.	n.s.	n.s.
	p =									
Mood	Z =					n.s.	n.s.	n.s.	-2.02	n.s.
	p =								0.04	
Interest	Z =						n.s.	n.s.	n.s.	n.s.
	p =									
Setting	Z =							n.s.	n.s.	n.s.
	p =									
Luck	Z =								-2.02	n.s.
	p =								0.04	
Ease	Z =									n.s.
	p =									

Table 24. Wilcoxon tests comparing ratings on attributions for poor performance at posttest.

		Effort	Strat.	Mot.	Mood	Interest	Setting	Luck	Ease	Help
Ability	Z =	n.s.	-2.02	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.
	p =		0.04							
Effort	Z =		n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.
	p =									
Strategy	Z =			-2.02	-2.02	-2.02	-2.02	-2.2	-2.2	-2.2
	p =			0.04	0.04	0.04	0.04	0.03	0.03	0.03
Motivation	Z =				n.s.	n.s.	n.s.	n.s.	n.s.	n.s.
	p =									
Mood	Z =					n.s.	n.s.	n.s.	n.s.	n.s.
	p =									
Interest	Z =						n.s.	n.s.	n.s.	n.s.
	p =									
Setting	Z =							n.s.	n.s.	n.s.
	p =									
Luck	Z =								n.s.	n.s.
	p =									
Ease	Z =									n.s.
	p =									

than ratings to (lack of) effort, (bad) mood, (poor) setting, (no) luck, or (lack of) help, and that ratings to task difficulty were higher than ratings to either (bad) mood or (no) luck. On the other hand, at posttesting, (lack of) strategy use emerged as the most highly rated factor, receiving ratings significantly higher than any factor other than (low) effort. This suggests that, as predicted, following the intervention, students were more likely to attribute poor performance to a lack of strategy use than to low competence on the task.

In sum, data from the attribution questionnaire suggest that students' patterns of attributions shifted during the intervention period. Specifically, students were more likely to attribute successful performance to internal rather than external factors. They were more likely to judge competence as at least partly responsible for good performance. And the highest attributions for successful performance were made to three internal and controllable factors: strategy use, motivation, and effort. At the same time, students were less likely to blame low ability or task difficulty for problems in performance. Instead, they were most likely to attribute failure to lack of strategy use.

The second source of data on students' attributions were students' responses to the open-ended questions asked during the attribution/strategy interview. The number of students who attributed performance to each factors at pretest and posttest, for successful and unsuccessful performance respectively, are presented in Figures 20 and 21. These data reveal that 7 out of the 10 causal factors identified in previous research were discussed by at least one student at pre- or posttesting. Note that when students were asked to orally explain their responses to the attribution questionnaire, they very easily did so as well. The facility with which students could speak about the causal factors supports the validity of attribution constructs.

The most commonly reported factor responsible for either successful or unsuccessful performance, across pre- and posttesting, was strategy use. Students also acknowledged a range of other factors, including ability, effort, interest, setting, ease, and

Figure 20. The number of students describing each cause for successful performance during the attribution/strategy interview.

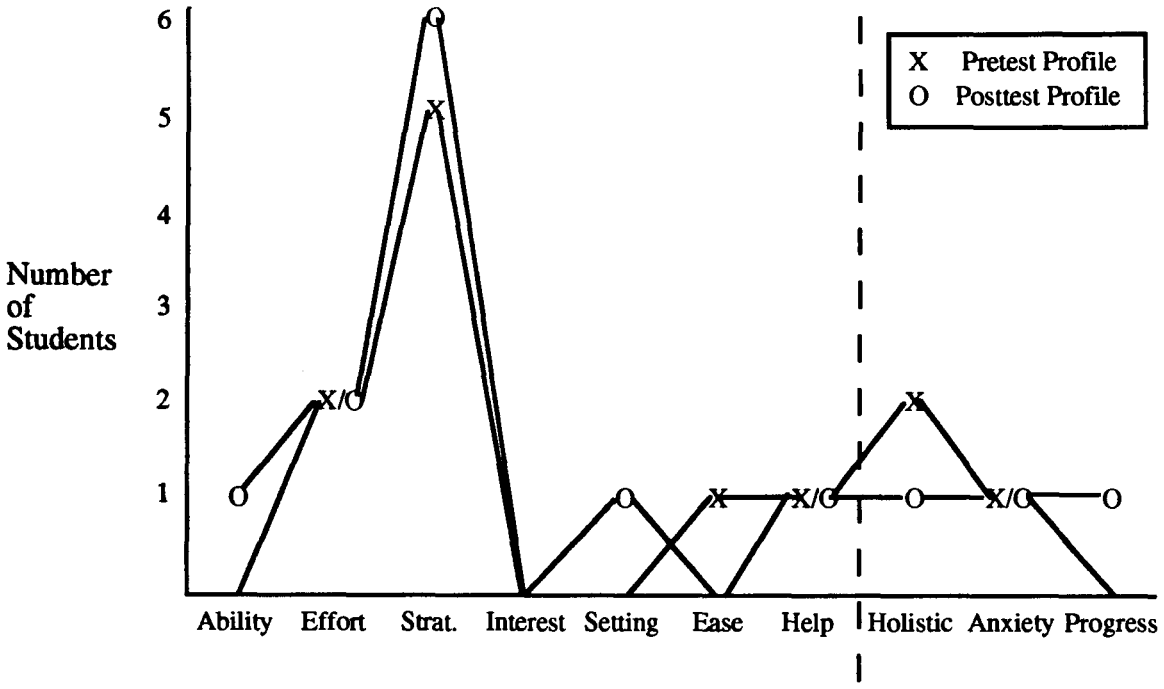
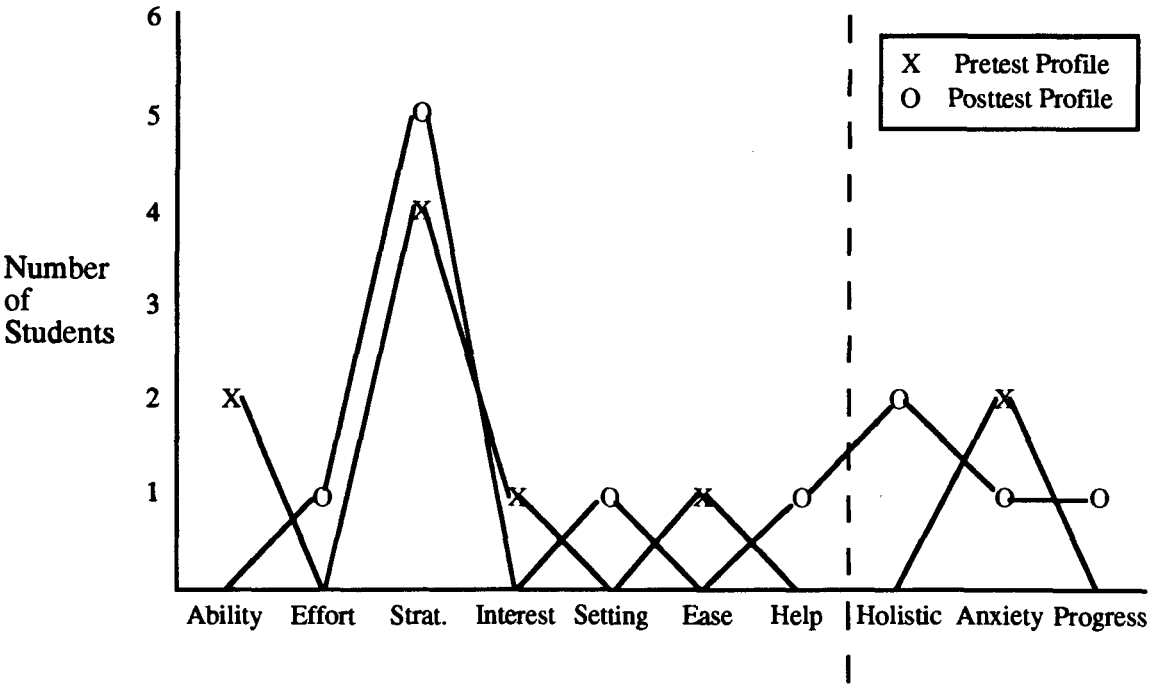


Figure 21. The number of students describing each cause for unsuccessful performance during the attribution/strategy interview.



help. Of some interest is that students described three types of factors not directly addressed in previous research on attributions. These were categorized in this study as holistic, anxiety, and progress. Holistic factors reflected the influence of the broader context in which students completed a task. For example, one student commented that how much sleep she got the night before was a major determinant of performance. Another suggested that her daily schedule and the time available for task completion was critical, considering the greater demands of her day (e.g., children's needs). Second, not only did students report increased anxiety following poor task performance, but two students described how panic or anxiety led to poor task performance. Finally, one student emphasized that perceptions of progress associated with effort expended were essential to maintaining motivation and therefore promoting achievement.

In sum, these analyses generally support the importance of most of the attribution factors identified in previous research. Nonetheless, several students' emphases on holistic factors provide a good reminder that task performance is not completed in isolation. For adults with learning disabilities, who often juggle multiple responsibilities while attending school, strategies for handling a range of responsibilities may be prerequisite to promoting academic success.

What gains did students perceive following the intervention and how did students account for perceived improvements?

Students' perceptions of gains achieved through participating in the study and factors responsible for those gains were examined based on students' responses to final interview questions. First, students' descriptions of perceived gains corroborate earlier evidence of gains in task performance, strategy use, and perceptions of self-efficacy. As reported earlier, 5 out of 6 students explicitly described gains in feelings of competence or confidence when completing their task. Five out of the six students also described improvements in task performance. For example, Joanne (J) explained that the letters she now produces are superior and easier to construct:

R: OK, great. Do you think you've achieved the goals you wanted to achieve during this study?

J: Yes, I achieved to enhance my writing, and I have.

R: OK, and how do you know? Why do you feel that way?

J: I've, um, achieved that at school, some of the letters, the majority of, at work. The letters that I do I'm able to do, to do a letter without really thinking, gee, here we go, do another letter. Right? It's more of a thing that happens, instead of as such a struggle, it's just a thing that happens.

Further, all six students described improvements in their approach to tasks. For example, Joanne reported: "Well, the best thing I ever had was that guideline ... And that's, that's why, how I can write today. That's the reason. You know, I follow those steps. I don't, I mean, that paper is like a piece of gold to me, right? So that's important. That's like one of the things too that's majorly important. From what I've done." Similarly, Nancy stated, "Well, I've gained a technique of how to write. Which is really important. I've gained a style of writing. And, um, and I've also gained, a strategy, like a way of writing which I never had before".

Kathy also explicitly noted that she had gained tendency to reflect more when completing tasks:

K: But, it's helped me problem solve. Like, that's the thing. I'm I'm, it's a, you know, I, you know I'm recognizing the problem I had, and then working with it. Applying, implementing new, strategies that solve the problem, so I can go on.

R: That's right. Which is, yah good, good. Which is the whole point is where the strategies, come from.

K: It makes me stop and think, OK?

In sum, these analyses suggest that students believed they had improved in their ability to tackle tasks, that they associated the acquisition of strategies with these improvements, and that they felt more competent and confident as a result

Although not directly asked, at some point during the final interview, all students provided an explanation for the gains they had achieved. Based on a coding of students' responses, five dimensions of the approach were considered critical by most students. These were that the researcher provided guidance and suggestions, but didn't tell students what to do; that the student and instructor collaborated to develop strategies by trying them in actual tasks and modifying them if they didn't work; that the strategies developed were built on students' strengths, were personalized, and made sense to students in their own words; that the intervention atmosphere was positive and supportive; and that the meeting schedule was flexible enough to accommodate students' immediate needs.

To provide a more detailed analysis of students' perceptions of the characteristics of the intervention and its link to improved performance, excerpts illustrative of each of the critical dimensions are provided below. First, all six students stressed the importance of being asked to think through problems rather than being told what to do. They indicated that the researcher's role was to provide guidance and suggestions, without undermining their active role in completing the task. For example, Linda stated, "It's um, you've given me guidance rather than telling me what to do or how to do it, which, is a completely different approach to what I've had, ever had." Similarly, Nancy explained:

N: We worked together, and I thought it was really great the way you taught because, you didn't tell me how to do it. You sort of made me think it through. So, not only did I understand it, because I had to think it through, but it also, it made more sense to me that way. And it was great because you gave me, you explained to me, OK, you're stuck here, what do you think you can do here? And you gave me options, and, uh,

and, I sort of picked the options, and I worked it from there. It, sort of, you weren't telling me what to do, but you were sort of leading me in the right direction.

These data support the hypothesis that students benefit when provided with scaffolded support which assists them to construct for themselves understandings about tasks and strategies.

Second, all six students described the process of setting goals, trying strategies in actual tasks, monitoring strategy effectiveness, and modifying strategies if they weren't working. An example was provided by Linda, who clearly described the process of building strategies:

L: The whole process of coming up with methods—you set out, asked me what I needed, what my goals were, what I needed to find—what I needed to do, to achieve. And, so, you helped me build up strategies for working, strategies for learning the material, strategies for solving problems so that, and then, revising that, and keep going back and having a look at it, and see if it is working, trying it out, and perhaps adding something in, so that it, especially with the learning strategy, I think, it's gradually changed or evolved anyway throughout this semester, so that, my approach has become more concrete, and it, you know something that does work, and that I can apply and use. And the same with problem solving, is to keep going back and sort of helping me to recognize what I need to do, and making it concrete, whereas before it wouldn't, wouldn't occur to me to try and- strategies make a huge difference for me.

Third, all six students also stressed that their strategies were helpful because they were tailored to their unique needs, building on what they could do well. For example, Mike stated:

M: I don't think it's good to have somebody telling you like, this is what you should do. Because that person that, you know, told you that this is the way that you should, you know, you should study, it may work for them, it may not work for you, right? So it was something that we worked on it together, and, said, well, it didn't work, I think we should, you know, try something different, right? And that's what we did. We worked on different strategies that we should do.

Similarly, Jennifer explained, the "thing was, just the main things I think were the good points were, that you didn't go with what's best for the majority of people. That, well, this is the skill that helps most people, so why doesn't it help you, like, building on what you already have so you feel more comfortable with it? Cause I mean, I have good organizational skills, but somebody else might not, like they might have good vocabulary skills, or good, sentence structure skills, or have really good grammar- and just build on that so that the person feels more confident." Finally, Linda agreed:

L: Well, they're sort of tailored to my own personal needs. Which, everyone's different and has their own, their own ways of approaching things, and, you know, different goals, so it's, rather than being giving, sort of a recipe, this is what you need to do, it's been extremely helpful, because it means that it's, methods which I can use for the way I work. So that, I can solve problems, rather than trying to follow some, you know, set procedure which may work for some people, but that might not work for me. Well, it might work, but, um, you know, as I said, everyone's different, so it's, I mean these methods are specific for my needs.

A fourth dimension emphasized by students was the positive, supportive environment in which the intervention was conducted. Three students explicitly stressed

that, by building on what they could do, their confidence was increased rather than undermined. For example, Jennifer explained:

J: And also, with all my essays and stuff, I was getting more, like working with you on each point, is more building self-esteem or self-confidence, cause you'd say, oh yah, well I really like this. And then say, well, this could be worked on, and it's kind of, kind of give you a push. So you'd feel OK about yourself, like, it's not, like, cause when I hand an essay to my Mom, she'll say this is horrible, how could you write this? With you, it's pick out, well, this is really good, this is really good, but you could work on that. Which is the same message, just in a more positive way, so you don't feel like, oh god, I'm horrible.

Finally, two students mentioned that it was helpful to schedule intervention meetings responsively to their course demands. For example, Linda was grateful that meetings could be scheduled more frequently close to exams. Similarly, Jennifer described, "I mean, you catered to all our, all our different time tables and everything, and all that kind of stuff. "

In sum, analyses of students' perceptions of the intervention approach closely matched what the researcher had intended to do, providing evidence for the fidelity of implementation. Students credited gains to those aspects of the approach which the researcher had identified, *a priori*, to be central. Finally, students' explanation of gains in terms of characteristics of the intervention supports attribution of gains achieved to participation in the intervention, rather than to competing historical factors operating concurrently.

V. DISCUSSION

In cognitive intervention research, the intent of instruction is not merely to promote expert use of a set of procedures or heuristics for completing a specific task. Rather, the expectation is that students will become strategic learners who flexibly select and employ task-appropriate strategies. Strategic learners internalize and personalize strategies, adapt them for the task at hand, and apply them over time. In short, effective learners are self-regulating (Borkowski & Muthukrishna, 1992; Ellis, 1993; Englert, 1992; Palincsar & Brown, 1984; Pressley et al., 1987; Schumaker & Deshler, 1984; Zimmerman, 1989).

The research described here investigated the effectiveness of an intervention program designed to promote self-regulated learning, Strategic Content Learning (SCL). Previous approaches to strategy training, such as those based on direct instruction (Borkowski & Muthukrishna, 1992; Ellis, 1993; Pressley, 1986; Schumaker & Deshler, 1984) or sociocultural perspectives (Englert, 1992; Palincsar & Brown, 1984), have focused on teaching students specific cognitive strategies. In SCL, the focus of instruction has shifted to supporting students to approach learning tasks strategically.

Participants in the research were six adults with learning disabilities enrolled in post-secondary education programs. Each student chose a task that was of importance to him or her in current or future academic work (reading, writing, or solving math problems). During each instructional session, discussion focused on completion of actual course assignments. At a second level, however, students were also supported to reflect on their learning: to define and select among alternative approaches, to evaluate their effectiveness, to monitor progress, and to modify goals and/or approaches if appropriate. Based on their accumulating experiences with tasks and strategies, students were supported to mindfully abstract (Salomon & Perkins, 1989; Wong, 1992) general principles about tasks and strategies, thereby constructing an understanding of cognitive processing. As a result, over time specific strategies were formalized. However, rather

than being defined in advance by the researcher, strategies evolved out of student-teacher collaborations and were expressed in the students' own words.

It was expected that participation in the intervention would promote self-regulation, first, by encouraging independent engagement in regulating activities, and second, by furthering development of supportive knowledge (see Chapter 1, Figure 1). In terms of cognitive processing, it was predicted that, over the course of the intervention, students would assume an increasingly active role in developing and personalizing strategies to meet their unique needs. It was expected that they would implement strategies effectively, leading to improved task performance. It was also expected that students would independently implement strategies when engaged in similar tasks across contexts (transfer) and over time (maintenance). Finally, it was expected that students would develop a disposition to attack tasks generally in a problem-solving and strategic manner, as evidenced by adaptation of strategies for use in non-instructed tasks. In terms of knowledge development, it was predicted that improved task performance would foster development of domain-specific knowledge. It was also expected that students' knowledge about tasks and strategies would increase, resulting in greater abilities to articulate task goals and effective strategies. Finally, changes to motivational beliefs were anticipated, including increases in perceptions of self-efficacy and attributional shifts.

In the discussion which ensues, findings related to each of these predictions are discussed. This is followed by consideration of limitations of the study, implications, and directions for further research.

Discussion of Research Findings

Students' Roles in Developing Strategies

The first research question in this study was "Do students demonstrate active involvement in the development, use, and modification of strategies during the intervention?" To address this question, students' strategy sheets, the researcher's field

notes, and transcripts of intervention sessions were reviewed. From the beginning, students evidenced an active role in strategy development. Specifically, during each session, students were supported to propose, implement, and evaluate strategies. Further, analyses revealed that in later sessions, five out of six students independently added steps to their strategy based on approaches they had tried and evaluated outside of discussions with the researcher. This latter result indicates that students began to assume responsibility for their strategies and to modify strategies independently in response to task demands.

Swanson (1990) has suggested that the strategic processing of students with learning disabilities is deficient in at least three ways. First, these students tend to employ weak, general problem solving heuristics rather than more powerful, domain-specific strategies. Second, even when students master strategies, they are unlikely to adapt them over time. Finally, these students have difficulties when coordinating or regulating the use of strategies. Results from this study suggest that the strategic processing of students improved in each of these respects.

First, during the intervention, students and the researcher collaborated to develop strategies within the context of meaningful tasks. Review of the strategies which evolved (see Appendix 2) reveals that each student developed one or more task specific strategies to supplement general problem solving heuristics. Second, results indicate that over the course of the intervention, five out of six students independently implemented, evaluated, and modified their strategies. This suggests that SCL supported strategy adaptation. Finally, students' modifications to strategies required the selection, implementation, monitoring, and adaptation of strategies. These are the executive processing activities that Swanson described as being so difficult for many students to engage and which are reflective of self-regulation (Borkowski, 1992).

Task Performance, Strategy Implementation, Transfer, and Maintenance

In this section, results pertaining to research questions 2 and 3 will be discussed: "Do students transfer strategy use to similar tasks in other contexts and maintain strategy use into the next semester?"; "Does task performance improve on training tasks and on similar tasks completed either in other contexts (transfer) or during the next semester (maintenance)?" Direct evidence of strategy implementation (e.g., notes, outlines, rough drafts) revealed, first, that all students implemented strategies while completing training tasks. Second, five out of the six students provided evidence of strategy use in similar tasks outside of the intervention context. Finally, each of the three students tracked into the subsequent semester provided evidence of maintained strategy use. Analyses of task performance data revealed a similar pattern of findings. First, for all six students, achievement improved on training tasks. These results suggest that development of task-specific strategies assisted students to complete assignments more effectively. Performance data for similar tasks completed outside of the intervention context were also available for five students. Analyses indicate that performance improvements transferred to these tasks. Finally, of the three students who could be tracked into a subsequent semester, performance data was only available for two. Each of these students maintained performance improvements on similar tasks into the next semester.

Taken together, these results suggest that the SCL intervention was effective in promoting transfer and maintenance of strategy use, resulting in improved task performance across contexts and over time. Of particular importance, if SCL is to serve as a model for individualized intervention for adults with learning disabilities, is the finding that SCL instruction is associated with performance gains on a range of qualitatively different tasks, including reading, writing, and math.

While researchers generally acknowledge the importance of promoting strategic learning by students with learning disabilities, fostering development of domain specific knowledge is also critical (Wong, 1985; 1987). As noted earlier, strategy utilization and

domain specific knowledge are interdependent (Alexander & Judy, 1988; Perkins & Salomon, 1989). For at least three students in the present study, results suggest that SCL increased students' abilities to build knowledge more independently. Evidence related to this point comes from the two students who developed strategies for comprehending and studying from text (Mike, Kathy) and from the student who developed a strategy for building conceptual knowledge in math (Linda). For these students, improved task performance reflects refined abilities to construct domain-specific understandings. This is important because students in both secondary and post-secondary settings, as well as adults outside of formal education, are required to learn a great deal for themselves.

Attacking a Variety of Tasks Strategically

Improved task performance is a commonly observed effect in cognitive intervention research but findings of transfer and maintenance remain elusive (Borkowski, 1992; Wong, 1991). In contrast, in this study students demonstrated transfer of two types. First, as described above, students implemented strategies when completing similar tasks across contexts and over time. Second, results suggest that students developed a disposition to approach non-instructed tasks strategically. In this section, attention turns to evidence related to this second type of transfer and to the fourth research question: "Do students transfer strategic processing to different tasks and demonstrate improved performance on those tasks?"

Results indicate that five out of six students spontaneously described adapting strategies for use in non-instructed tasks and the performance improvements that ensued. For example, Mike, who developed a strategy for reading, explained how he adapted his strategies to study math and explicitly associated strategy use with the best mark he had ever received. This finding indicates that students not only learned specific strategies through the course of the intervention, but they also learned to approach tasks in a problem-solving and strategic manner. As Kathy realized at the end of the intervention, "All of a sudden, bang, I saw that it was ... a way to help solve my problem, and you

know, and it just, and the strategy is basically ... a way and a means to solve a problem that I have." This is perhaps the best evidence of students' developing self-regulation (Borkowski, 1992). Because of the importance of this finding, in future research on the SCL approach, students' strategic approaches in non-instructed tasks should be more systematically assessed.

The SCL approach was based on analysis of current approaches to strategy training (e.g., Palincsar & Brown, 1984; Pressley et al., 1987) and of transfer (e.g., Salomon & Perkins, 1989). As a result, several characteristics of the approach were expected to promote transfer and may be responsible for the effects observed. One characteristic is that students were supported to mindfully abstract principles about cognitive processing. Students reflected on approaches tried and explicitly formalized strategies. Further, when students abstracted principles, they described approaches in their own words, thereby constructing understandings about cognitive processing based on experiences with tasks. Both Salomon and Perkins (1989) and Wong (1991) have hypothesized that such reflective activities are likely to promote high-road, consciously regulated transfer.

Interview data implicate this characteristic as a contributing factor to strategy transfer and maintenance. In a final interview, students described gains they had achieved and aspects of the approach they felt were responsible for those gains. All six students indicated that the researcher's role was to provide guidance and suggestions, without undermining their active role in abstracting understandings, developing strategies, and thinking through tasks. For example, Nancy explained: "We worked together, and I thought it was really great the way you taught because, you didn't tell me how to do it. You sort of made me think it through. So, not only did I understand it, because I had to think it through, but it also, it made more sense to me that way." Similarly, Joanne explained that her strategy made sense to her because she remembered where steps came from. When describing her strategy she said: "It's important to know, like, I mean, I could read that thing over, and if it, had it been your writing, or maybe it

was something from a book and all that- it probably wouldn't have hit me as hard. Because those steps that we went through- I remember doing those ... like that's something that happened to me, doing the letter."

Researchers have stressed that for transfer to occur, students must perceive the value of strategies. One means to achieve this is to contextualize instruction, teaching strategies in content (Borkowski & Muthukrishna, 1992; Ellis, 1993; Palincsar & Brown, 1984). This is a characteristic that SCL shares with other strategy training approaches (Ellis, 1993; Englert, 1992; Palincsar & Brown, 1984). It makes sense that when students apply strategies in meaningful work and observe improved performance, they will perceive strategy value. It is also possible that students construct conditional knowledge about strategies by applying them across tasks. For example, during several sessions Jennifer explained how she adapted her writing strategy to novel essays. She remembered how she applied the strategy for different tasks during our meetings and used those modifications as models when confronting new assignments. She understood when and how different procedures should be used based on her experiences across tasks.

It was also expected that students would value strategies because they were personalized. As noted earlier, many researchers emphasize the importance of tailoring strategies to individual needs (Borkowski & Muthukrishna, 1992; Ellis, 1993; Montague, 1992; Swanson, 1990). In SCL, strategies were individualized in that students were responsible for the definition of strategies and for expressing them in their own words. Further, strategies built on students' unique strengths and preferences and addressed their priorities and needs. Each of these elements was described as important by students in their final interviews.

For example, Kathy clearly felt ownership over development of her strategy. She said, "You helped me find a solution to my own problems. You know. That, I, you helped me, like, um, your role was helping me to find my own solution to my own problem, rather than you telling me." Both Jennifer and Joanne stressed the importance

of defining strategies in words they understood. Jennifer explained, "Well, basically you were just picking up on what I was saying, and from what I liked to do, working it, from what I liked to do to what I was doing, so that, it wasn't something completely foreign to me." Similarly, Joanne said she developed strategies "that, that are shaped for me. The way that I think, the way that I understand, the wording that I understand. It's not in the way, like, it's not your form of writing, the way, like, even a sentence that makes sense, it's my way so that, when I read the guideline I don't think, well, gee, what did that mean? Like, I know because it's my words." Linda emphasized that the strategy was responsive to her unique needs and goals: "Well, they're sort of tailored to my own personal needs. Which, everyone's different and has their own, their own ways of approaching things, and, you know, different goals, so it's, rather than being giving, sort of a recipe, this is what you need to do, it's been extremely helpful, because it means that it's, methods which I can use for the way I work." These excerpts suggest that students' perceptions of strategy value were also linked to the personalization of strategies.

A final characteristic of the SCL approach which may have been in part responsible for observed transfer in this study was the involvement of students in monitoring and evaluating strategies throughout the intervention. Strategy training approaches which engage students in these types of Metacognitive Acquisition Procedures (Borkowski et al., 1989) or Strategic Analysis Activities (Ellis, 1993) may be more likely to promote self-regulation (Wong, 1991).

In sum, results from this study suggest that students not only transferred strategy use to similar tasks across contexts and over time, but also became generally more self-regulating. First, over time students became more active in developing strategies. Second, students adapted strategic approaches for use in other tasks. While some evidence is available linking specific characteristics of the SCL approach with these effects, further research is necessary. As Swanson (1990) notes, when multifaceted

intervention approaches are investigated, componential analyses may be necessary to isolate the most critical components.

Metacognitive Awareness about Tasks and Strategies

The fifth research question was "Do students demonstrate increased metacognitive awareness about tasks and strategies over the course of the intervention?" Results relevant to this question were drawn from two sources, students' written responses to questions on the metacognitive questionnaire and students' oral answers to the attribution/strategy interview. Both sources reveal a significant improvement in students' knowledge of tasks and strategies from pre- to posttest.

These results suggest that SCL promoted development of two types of knowledge important to self-regulation, knowledge about tasks and knowledge about strategies. First, results indicate that students generally improved in their ability to define task goals clearly and accurately. This finding is critical because, when students adopt vague or inappropriate goals, learning efforts aren't productively focused. As an example, consider changes in Linda's perceptions of math problem-solving from pre- to posttest. At pretest, Linda assumed that problem solving requires matching problems to solution algorithms. At posttest, Linda more productively recognized that problem solving requires representing problems in terms of conceptual knowledge and deriving a solution plan based on that representation. In Linda's case, developing a math problem solving strategy by itself would have been insufficient to improve performance. Her strategic processing would have been undermined by her perception of the task.

This example illustrates the importance of promoting the process of self-regulation rather than just mastery of strategies. In this study, when students were required to articulate task goals explicitly, current understandings about tasks were exposed. The instructor could then support students to consider task goals and to amend their knowledge about tasks. Findings from this study support the contention that task knowledge may support, or undermine, effective self-regulation.

Second, results also suggest that students' knowledge about strategies increased, corroborating findings described earlier. Comparison of students' strategy descriptions at pre- and posttest reveal patterns consistent with previous research. Specifically, when Swanson (1988) compared the strategies used by learning disabled and nondisabled students when completing a picture arrangement problem solving task, he found that students with learning disabilities relied more on heuristics than specific, systematic problem-solution strategies. In this study, at pretest, reported strategies were general or not clearly articulated. In contrast, at posttest, all students were able to describe elaborated task-specific strategies. These results suggest that, in addition to knowledge about tasks, the SCL approach promoted development of specific strategy knowledge (Borkowski & Muthukrishna, 1992; Pressley, 1986).

Perceptions of Self-efficacy and Attributional Patterns

The SCL approach was expected to have effects on two types of motivational beliefs, perceptions of self-efficacy and attributions for performance. In this section, results pertaining to research questions 6 and 7 are discussed. These questions were: "Do students' perceptions of self-efficacy increase over the course of the intervention?" and "Do students' patterns of causal attributions shift over the course of the intervention?"

Data on students' perceptions of self-efficacy were derived from three sources: students' responses to the self-efficacy questionnaire, students' rating of their ability on the metacognitive questionnaire, and oral responses to the final interview question, "What do you think you have gained by participating in this study?" Results from these sources consistently suggest that students' perceptions of self-efficacy improved from pre- to posttest. Not only did quantitative analyses reveal significant pre-post differences on self-efficacy ratings, but students also described gains in confidence and competence during the final interview session.

Data on students' attributions for success and failure were derived from two sources: oral responses to the attribution/strategy interview and ratings of each of ten factors on the attribution questionnaire. Analyses of these data reveal a shift in students' attributions from pre- to posttest. At posttest, students were more likely to credit success to their ability on the task, the amount of effort expended, strategy use, motivation, and/or mood, while help from others was perceived as less influential. The highest attributions for successful performance were made to three internal and controllable factors: strategy use, motivation, and effort. At the same time, students were less likely to blame low ability or task difficulty for problems in performance. Instead, they attributed failure to lack of strategies. These findings are consistent with the predictions of this study and with findings of previous research (Borkowski & Muthukrishna, 1992; Borkowski et al., 1986).

In this study, students' attributions to ability showed an interesting pattern. At pretest, students most often associated failure with their own lack of competence but rarely credited success to ability. This pattern reversed at posttest, where students were more likely to associate success with ability and were less likely to blame ability for failure. These results are consistent with the findings on self-efficacy. It may be that as students' perceptions of control and competence increased, they came to perceive task approach and their developing competence as important contributors to performance, with a corresponding decrease in emphasis on low ability or extraneous factors.

Data on students' attributions for success and failure were also derived from students' responses to the attribution/strategy interview. In contrast to the attribution questionnaire, which constrained students to rate the causal influence of ten predefined factors, the interview was less structured. This afforded students opportunities to describe important factors not represented on the attribution questionnaire. Analysis of students' oral descriptions revealed that 75% (36 out of 48) of the factors described by students corresponded to those explored in attributional research (Relich et al., 1986;

Schunk & Rice, 1986; Weiner, 1974). This provides evidence for the validity of attribution constructs. Of the remaining factors identified by students, five were coded as "holistic", reflecting the influence of the broader context within which specific tasks were completed (e.g., amount of sleep, overall scheduling constraints, demands by ill children), five related to anxiety, and two explicitly referenced perceptions of progress. Students' emphasis on holistic factors provides a good reminder that task performance is not completed in a vacuum. For adults with learning disabilities, who often juggle multiple responsibilities while attending school, strategies for handling a range of responsibilities may be prerequisite to promoting academic success.

Which characteristics of the SCL approach might account for these motivational shifts? Borkowski and Muthukrishna (1992) hypothesized that the monitoring of performance and perceptions of progress might be responsible for motivational changes. Findings in support of this hypothesis were recently provided by Schunk and Swartz (1992). These researchers provided training in writing strategies to three groups of students. All students participated in the same training program and received performance feedback. Additionally, the first group was given a performance goal, to write a given type of paragraph. Groups two and three were both given strategy goals, to master the instructed strategy. Only the third group also received strategy feedback which focused on how well students were using the strategy. Results indicated that the strategy goal-plus-feedback group surpassed the paragraph goal group on perceptions of self-efficacy, progress, and strategy value, and surpassed both of the other groups on reported strategy use and confidence in their ability to improve. Schunk and Swartz (1992) conclude that the group differences could not be attributed solely to strategy training or performance feedback, which all groups received. Instead, they inferred that strategy feedback assisted students to monitor the quality of performance more accurately and that perceptions of progress led to increased self-efficacy. This finding suggests that

it may be engaging students in the process of monitoring and assisting them to gauge their performance relative to goals that is centrally responsible for motivational shifts.

Increases in perceptions of self-efficacy may also be associated with the process of building strategies on students' strengths. During the final interview, students suggested that the focus on what they could do, rather than assessing deficiencies, was a refreshing change. For example, Jennifer explained, "Working with you on each point, is more building self-esteem or self-confidence, cause you'd say, oh yah, well I really like this. And then say, well, this could be worked on, and it's kind of, kind of give you a push. So you'd feel OK about yourself." Similarly, Kathy said, "Um, I like the, your approach, in a friendly manner. Caring manner. You know. Also, 'these are', OK, 'these are the good points' ... I like the reinforcement effect. Like, 'OK, that's really good'."

Finally, the transfer effects observed in this study also may be associated with the observed changes in motivation. Students' perceptions of self-efficacy and attributional beliefs not only develop through experiences but, in turn, influence subsequent new learning. The goals students adopt, persistence in tasks, and strategies selected are all influenced by motivational beliefs (Bandura, 1993; Zimmerman, 1989). Similarly, strategy training programs which include attributional retraining have been more successful in promoting transfer (Borkowski et al., 1986; Wong, 1991).

Students' Perceptions of the Approach

In the final interview, students were asked to describe the intervention and what they had gained during the process. A sampling of these comments have been reported already in this chapter. These qualitative data most directly address the eighth and final research question, "What gains do students perceive following the intervention, and how do students account for perceived improvements?"

Students' perceptions of gains corroborate evidence obtained from other sources, particularly evidence showing gains in strategy knowledge and strategic processing, performance, and self-efficacy. For example, all six students described improvements in

approaches to tasks. Five of the students described improvements in task performance and five explicitly described increases in feelings of competence or confidence. Further, although not directly asked to, all students provided an explanation for the gains they had achieved. The five dimensions considered to be most critical by students were: that the researcher provided guidance and suggestions, but didn't tell students what to do; that the student and instructor collaborated to develop strategies by trying them in actual tasks and modifying them if they didn't work; that the strategies developed were built on students' strengths, were personalized, and made sense to students in their own words; that the intervention atmosphere was positive and supportive; and, that the meeting schedule was flexible enough to accommodate students' immediate needs.

Limitations of the Research

The most obvious limitation of this research is the small number of participants. Further, it is possible to question how representative the participants were of adults with learning disabilities. The sample were clearly unusual in one respect; all students were enrolled in post-secondary education. While some students with learning disabilities are currently attending college, the majority of individuals most likely do not. Additional research is clearly indicated to explore the generalizability of the findings.

While students had in common participation in post-secondary education, they were nonetheless very different. For example, the range of education between students was still great. While one student was obtaining his high school equivalency, another was enrolled in graduate school. Students attended three different campuses. Also different were the tasks students chose, the problems they experienced while working through tasks, and students' specific processing difficulties. In these aspects, participants represented well the heterogeneity of the learning disabled population. The success of the program in promoting self-regulation by such a diverse group of students suggests that it may well be generalizable. Similarly, as noted earlier, the success in promoting achievement gains across reading, writing, and math tasks is encouraging.

A number of causal relationships were hypothesized in this study. For example, it was expected that the intervention approach would lead to greater self-regulation and that certain characteristics of the SCL approach would be associated with transfer. While results were certainly consistent with these hypothesizes, alternative explanations for effects cannot be completely ruled out. In general, single group pre-post designs are vulnerable to numerous threats to internal validity, such as history, maturation, or statistical regression (Cook & Campbell, 1979). In the current study, in-depth analysis of six parallel cases studies were embedded within the pre-post design to facilitate more direct association of instruction with outcomes. For example, observation of concurrent changes in strategy implementation and task performance strengthen inferences that the development of strategic approaches was associated with performance gains. Further, in final interviews, students' descriptions of the intervention matched the characteristics intended by the researcher; described gains paralleled effects observed; and students explicitly linked characteristics with gains. While such self-report data are not by themselves conclusive, they support an inference that participation in the intervention was at least in part responsible for the benefits observed.

In addition, several alternative explanations for the results in this study are not tenable given the characteristics of the participants. Specifically, participants were adults with learning disabilities who had experienced a long history of failure on their chosen tasks. Statistical regression is therefore unlikely, as students were not selected for inclusion in the study based on a single, unrepresentative measure of task performance. Further, students received no other systematic support over the course of the semester and it is unlikely that, after such a long history of difficulty, they would have improved on either task performance or perceptions of self-efficacy without intervention. That students in the study were self-selected may threaten the representativeness of the sample, but is an unlikely threat to internal validity. While these students were highly motivated to achieve, efforts expended had not been sufficient to improve performance previously.

Motivation alone is therefore unlikely to have produced the effects observed here. Nonetheless, while many threats to internal validity can reasonably be ruled out, future research might employ alternate designs to corroborate the findings in this study.

Implications and Directions for Further Research

The current study is of both practical and conceptual importance. First, the SCL approach represents a potential model for providing academic support to adults with learning disabilities in post-secondary settings. Consider the role of support services in this regard. Students accessing services present a variety of difficulties, are enrolled in a range of courses, and need help with an assortment of tasks. Students are concerned with pressing problems that require immediate attention. Those who support these students must be maximally effective in a limited time. The SCL model may be beneficial in this context. It provides effective, efficient support addressed to individual needs but at the same time promotes independence, rather than continued reliance on supports.

Further, while the research described here is being conducted in an academic domain, LD adults have been shown to have difficulties, not only in educational, but also in vocational, social, and daily living contexts (Barr, 1990; Polloway et al., 1988). The SCL approach may be helpful in assisting adults with learning disabilities to generate strategies for coping with tasks or problems across life domains. Because little research exists on providing effective support for learning disabled adults in vocational, social, or community settings, research on the use of SCL in those contexts would also be instructive.

The results described here suggest that SCL is a promising form of intervention for LD adults in post-secondary settings who need individualized, powerful, and immediately effective strategies for dealing with coursework. The approach may also be valuable when providing individual assistance to younger students with learning disabilities in school settings. For example, adolescents with learning disabilities face many of the same challenges as adults in post-secondary settings. The SCL intervention presents a

model where these students may be supported, not only to achieve in actual coursework, but also to become more strategic about learning generally.

Further, in the current study, SCL instruction was individualized. However, because discussion and brainstorming of alternative approaches is central to the approach, it may be feasible to employ SCL with small groups. Students may benefit from discussions where they can observe alternative approaches of peers in the context of common tasks. Similarly, both Ellis (1993) and Borkowski & Muthukrishna (1992) argue that, in later stages of strategy training, students should engage in small group discussions about strategies as a means of building strategy knowledge and supporting adaptation and transfer of strategies. The research reported here suggests that students benefit from engaging in such Strategic Analysis Activities (Ellis, 1993) or Metacognitive Acquisition Procedures (Borkowski et al., 1989) early in instruction. Future research is therefore warranted into the effectiveness of SCL in small group or classroom settings.

While, in the present study, attention has focused on the practical benefits of the SCL approach for adults with learning disabilities, the research also addresses broader conceptual issues related to instruction and learning. Researchers have agreed that promoting self-regulated and strategic learning is a fundamental goal in cognitive intervention research. SCL provides a theory-based model designed to achieve that end. It is founded on prior research and on conceptual analyses of learning, instruction, and transfer. Central in the SCL model are two assumptions; first, that students learn to self-regulate by engaging in the sequence of cognitive processes central to self-regulation and, second, that students construct knowledge about cognitive processing based on those experiences.

Many current instructional models (Borkowski & Muthukrishna, 1992; Ellis, 1993) presume that the first step in the development of self-regulation is mastery of one or more specific strategies. As an alternative, in SCL, it is argued that strategic learning is best

promoted by engaging students in the recursive cognitive activities central to self-regulation. First, what makes a learner proficient is not just adoption of specific strategies. Effective learners evaluate tasks, set goals, consider possible approaches, and then select or adapt strategies for the task at hand. Therefore, supporting strategic learning may require not just articulating task-specific strategies but also supporting engagement in this sequence of self-regulating activities. Second, reading researchers (Dole et al., 1991; Palincsar and Brown, 1984) have argued that strategic reading is best supported by providing scaffolded support as students engage in meaningful tasks rather than breaking reading into a series of subskills. A similar argument can be supported in this context. To help students recognize the complexity of strategic processing, it may be critical to provide students with scaffolded support as they participate in each of the activities central to self-regulation.

The second assumption underlying the SCL approach is that strategic learning is promoted if students construct understandings about cognitive processing for themselves. Researchers have stressed the importance of constructing understandings while completing academic tasks (e.g., Dole, Duffy, Roehler, & Pearson, 1991). Similarly, Paris and Byrnes (1989) adopt a constructivist perspective when describing self-regulation, emphasizing that students build theories about learning based on experiences with tasks. The SCL model elaborates our understanding by articulating the way in which students construct understandings about strategies. Specifically, in SCL, it is maintained that students construct understandings when they are asked to consider alternative approaches, describe their own cognitive processing and define strategies in their own words. These activities are presumed to require conscious abstraction of general characteristics about cognitive processing based on experiences with tasks. Borkowski et al. (1989) and Ellis (1993) have both argued that these reflective activities are associated with the development of strategy knowledge. Similarly, Wong (1991) and Salomon and Perkins (1989) have associated these activities with high-road, consciously

regulated transfer. In direct instruction models of strategy training, however, strategy adaptation and strategic analysis activities (Borkowski & Muthukrishna, 1992; Ellis, 1993) are reserved for the later stages of instruction. In SCL, these activities are thought to be pivotal from the beginning. Therefore, as students engage in self-regulating activities, they also are encouraged to abstract understandings about their learning as they engage in meaningful tasks.

Finally, in discussions of instructional alternatives, is often assumed that if students aren't taught strategies directly, then they must be discovering them for themselves (e.g., Pressley et al., 1987). In SCL, students are not left to discover strategies; if students need support in thinking of alternative approaches when completing a task, the instructor provides suggestions of what the student might try. However, it is not assumed that students internalize the strategy alternatives provided by the instructor. Students must ultimately construct an understanding of cognitive processing for themselves. Thus, SCL blends elements from direct instruction and discovery learning; students both learn from instructors and abstract understandings for themselves. This challenges researchers who portray these alternatives as mutually exclusive (e.g., Pressley et al., 1987).

In sum, model has both theoretical and practical implications. While further research is needed to isolate critical aspects of the approach, especially those associated with transfer, results of this study are encouraging. SCL appears to be a viable, efficient, and conceptually sound approach to providing support to students with learning disabilities, at least in post-secondary settings.

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APPENDIX 1
Samples of Materials

A. Consent form.

Fall Semester 1992

CONSENT FORM

This research project is evaluating an instructional approach designed to teach adult students with learning disabilities to approach tasks strategically. If you agree to participate in this study, you will do several things: (a) choose a task you would like to work on, (b) answer questions about your performance on the task in oral interviews and on questionnaires, (c) meet with the researcher approximately once a week to work on developing strategies to complete your task more effectively, and (d) work with the researcher to assess your progress on the task you have chosen. Some meetings with the researcher will be tape-recorded for the purpose of detailed analysis of student strategy learning and progress. All information collected will remain strictly confidential.

Participation in this research is completely voluntary. You may withdraw at any time without consequence or obligation. Your signature below means that you understand this option and that you are sincerely committed now to participating in the research.

If you have any questions about the research, please see Ms. Debbie Butler (principal researcher) in MPX 8645 (telephone 291-4548) or Dr. Bernice Wong (supervisor) in MPX 9505 (telephone 291-4115).

If you would like to receive a report of this study after data have been analyzed, please fill in an address below your signature to which we can mail it.

If you have any questions or concerns that cannot be handled by Ms. Butler or Dr. Wong, you can address them to the Dean of Education:

Dr. Robin Barrow 291-3148
Faculty of Education
Simon Fraser University
Burnaby, B.C. V5A 1S6

I acknowledge that participation in this experiment is completely voluntary, and I may withdraw at any time without any consequence.

Signature _____

Address _____

_____

_____
postal code

B. Questions asked as part of the attribution/strategy interview for the essay writing task.

I. Attributions

1. Think back to when you wrote a good essay. What factors were involved in (responsible for) your doing well on that essay?

Probe question, (if the student describes the essay itself, or what made it a good essay):

Given that you wrote such a good essay, why did you produce such a good essay in this instance?

2. Think back to when you wrote an essay that wasn't so good. What factors were involved in (responsible for) your having trouble with that essay?

Probe question, (if the student describes the essay itself, or what made it a poor essay):

Given that you wrote an essay that you don't think was very good, why did you produce a poor essay in this instance?

II. Strategy Use

1. Is there any particular method you use to write an essay?

C. Attribution Questionnaire for the essay writing task.

1. Think about a time when you wrote a good essay. Why do you think you did well? Rate how well each item describes why you did well. (Note: If you can't think of a time when you wrote a good essay, imagine yourself writing a good essay. Then rate how well each item describes why you would do well).

I did well because:	Not a reason that I did well		Somewhat of a reason		A major reason that I did well
I'm good at writing	1	2	3	4	5
I worked hard	1	2	3	4	5
I was lucky	1	2	3	4	5
I was in a good mood	1	2	3	4	5
The essay was easy	1	2	3	4	5
I was really interested in writing the essay	1	2	3	4	5
I was very motivated	1	2	3	4	5
I worked in a good setting	1	2	3	4	5
I had a good strategy for approaching the task	1	2	3	4	5
Someone else helped me	1	2	3	4	5

2. Think about a time when you wrote an essay that wasn't very good. Why do you think you didn't do very well? Rate how well each items describes why you didn't do very well.

I didn't do well because:	Not a reason that I did poorly		Somewhat of a reason		A major reason that I did poorly
I'm not good at writing	1	2	3	4	5
I didn't work hard	1	2	3	4	5
I wasn't lucky	1	2	3	4	5
I wasn't in a good mood	1	2	3	4	5
The essay was hard	1	2	3	4	5
I wasn't really interested in writing the essay	1	2	3	4	5
I wasn't motivated	1	2	3	4	5
I worked in a poor setting	1	2	3	4	5
I didn't have a good strategy for approaching the task	1	2	3	4	5
No one helped me	1	2	3	4	5

D. Questions asked as part of the metacognitive questionnaire for the essay writing task.

1. What is writing about?

2. Are there some things that you like about writing essays?
   Yes_____ No_____ No response_____

   What are they?

3. Are there some things that you don't like about writing essays?
   Yes_____ No_____ No response_____

   What are they?

4. Is writing an essay a hard thing for you to do?
   Yes_____ No_____ No response_____

   Explain?

5. How good a writer would you say you are?

   Excellent above average average below average very below average

   Why do you think so?

6. What things does a person have to LEARN to be a good essay writer?

7. Why do you think some people have trouble in writing essays?

8. What things do you need to learn to be a better writer than you are right now?

9. What goes on in your head when you write?

10. How do you write?

E. Questions asked as part of the self-efficacy questionnaire for the essay writing task.

Part I: Perceptions of competence and expectations for success.

(1) When writing a paper, it is easy for me to get ideas.

1	2	3	4	5
strongly disagree				strongly agree

(2) When writing a paper, it is hard for me to organize my ideas.

1	2	3	4	5
strongly disagree				strongly agree

(3) When writing a paper, it is easy for me to get started.

1	2	3	4	5
strongly disagree				strongly agree

(4) When writing a paper, I find it easy to make all the changes I need to make.

1	2	3	4	5
strongly disagree				strongly agree

(5) When writing a paper, it is easy for me to write my ideas into good sentences.

1	2	3	4	5
strongly disagree				strongly agree

(6) When writing a paper, it is hard for me to keep the paper going.

1	2	3	4	5
strongly disagree				strongly agree

(7) When writing a paper, it is hard for me to correct my mistakes.

1	2	3	4	5
strongly disagree				strongly agree

(8) When my class is asked to write an essay, mine is one of the best.

1	2	3	4	5
strongly disagree				strongly agree

(9) If my class is asked to write a story, mine is one of the best.

1	2	3	4	5
strongly disagree				strongly agree

(10) When my class is asked to write a book report, mine is one of the best.

1	2	3	4	5
strongly disagree				strongly agree

Part II: Task preference.

(1)	I like to write.				
	1	2	3	4	5
	strongly disagree				strongly agree
(2)	I would rather read than write.				
	1	2	3	4	5
	strongly disagree				strongly agree
(3)	I do writing on my own outside of school.				
	1	2	3	4	5
	strongly disagree				strongly agree
(4)	I avoid writing whenever I can.				
	1	2	3	4	5
	strongly disagree				strongly agree
(5)	I would rather write than do math problems.				
	1	2	3	4	5
	strongly disagree				strongly agree
(6)	Writing is a waste of time.				
	1	2	3	4	5
	strongly disagree				strongly agree

F. Meeting record form.

Student Name:

Date of Meeting:

Description/Purpose:

Record of Meeting

Brief Overview:

Task:

Strategies: (developed and modifications)

Self-efficacy/attributions:

Comments:

G. Sample quiz for Mike's assessment.

Mike- Quiz 4

I. Short Answer Questions

1. How has our ability to study the brain changed in the last century?

2. What does a PET scan measure, and what does it tell us about brain functioning?

3. What are the three layers that have evolved in the brain, and what is each responsible for?

	Layer	Function
1.	_____	_____
2.	_____	_____
3.	_____	_____

4. Where in the brain would you find the cerebellum (e.g. in what layer), and what does it do?

5. Name the parts of the brainstem that are responsible for the following:

Function	Part
Muscular control	_____
Regulates information flow into and out of the brain	_____
Regulates arousal and sleep	_____
Controlling heartbeat and breathing	_____

II. Multiple Choice/Matching Questions

1. Which is the order in which the layers in the brain evolved?
   (a) brainstem, limbic system, cerebral cortex
   (b) limbic system, brainstem, cerebral cortex
   (c) brainstem, cerebral cortex, limbic system
   (d) cerebral cortex, limbic system, brainstem

2. Higher mammals have increased capacities for learning and thinking because:
   (a) their brain stem is more evolved
   (b) they have left the influences of the 'old brain' behind
   (c) they are freed from the worries of basic survival
   (d) they have a more developed cerebral cortex

3. A PET scan:
   (a) measures electrical activity in the brain
   (b) measures glucose consumption in the brain
   (c) takes magnetic images of the brain
   (d) takes multiple x-ray images of the brain

4. The brainstem and the limbic system in humans function very differently from those in other more primitive mammals.
   True _____ False _____

5. The brainstem:
   (a) was the most recent structure to evolve
   (b) controls emotions
   (c) controls breathing, sleeping, and eating
   (d) controls information processing, thinking, and learning

6. Match each function to the corresponding brainstem structure (draw a line to match them up):

Function	Structure
Muscular control	Medulla
Regulates information flow into and out of the brain	Reticular Activating System
Regulates arousal and sleep	Cerebellum
Controlling heartbeat and breathing	Thalamus

7. A cat whose reticular activating system was destroyed would most likely:
   (a) eat too much
   (b) fail to wake up
   (c) not be able to see or hear
   (d) lose motor control
   (e) none of the above

8. The limbic system:
   (a) was the first structure to evolve
   (b) controls emotions
   (c) controls breathing, sleeping, and eating
   (d) controls information processing, thinking, and learning
   (e) both a and b
   (f) both a and c

9. The thalamus:
   (a) relays sensory information to the brain
   (b) controls arousal
   (c) controls balance
   (d) controls attention

10. The cerebral cortex:
    (a) was the most recent structure to evolve
    (b) controls emotions
    (c) controls breathing, sleeping, and eating
    (d) controls information processing, thinking, and learning
    (e) both a and d
    (f) both a and c

H. Final interview protocol.

Ask the student the following questions. Tape record the responses.

1. How would you describe what you have gained by participating in this study?

2. Have you achieved the goals you wanted to achieve during the study?

3. How would you describe the process we went through?

4. During our time together, it was my impression that you had gained in the following way..... Do you agree, or have I misunderstood?

5. If I were to work with another student in the future, what would you recommend that I do again, and what would you recommend that I do differently?

APPENDIX 2
The Development of Strategies by Each Participant

In this appendix each participant's strategy development is described in turn. In the descriptions which follow, all steps added at a meeting are italicized. All steps added in previous meetings, from any source, are presented in standard typeface.

A Chronicle of Jennifer's Strategy Development

I. Jennifer's Strategy Sheet from Intervention #1

Strategy	Code
1. *Research*	R/C
2. *Planning*	R/C
a. *make definition and rough notes first*	R/C
b. *find 2-3 main points- how notes interconnect*	R/C
c. *going through notes and fit them into the sections*	R/C
d. *make sure that you have good titles that connect back to the topic*	R/C
e. *talk to your stuffed animals as if you were explaining it to someone*	R/C

ANNOTATION: Intervention #1

At this session the instructor and Jennifer worked on Jennifer's plan for an economics oral report. After discussing and trying out methods, Jennifer decided on the steps she wanted to try out in subsequent writing tasks. She dictated these steps to the instructor, who wrote them on a strategy sheet (R/C).

II. Jennifer's Strategy modification in Intervention #3 (from field notes)

Strategy	Code
1. Research	
2. Planning	
a. make definition and rough notes first	
b. find 2-3 main points- how notes interconnect	
c. going through notes and fit them into the sections	
d. make sure that you have good titles that connect back to the topic	
e. talk to your stuffed animals as if you were explaining it to someone	
3. *Make plans*	
a. make a preliminary plan with an overview of the theme and main points/links and subpoints/ links	O/C
b. make a detailed plan with sentences as points and links between points built in	O/C
- make points in order	O/C
- tie back to main points	O/C
- link sentences to create a flow	O/C
- build definitions into the sense of the text	O/C
4. *Translate plans into an essay with paragraphs and formatting*	O/C

ANNOTATION: Intervention #3

At this session, Jennifer and the instructor continued to work on the economics oral report, taking an initial plan and moving it towards a written draft. At the end of this session, Jennifer reflected on what she had done during the session, and described the steps she wanted to follow orally. Because Jennifer did not make much use of written records of her strategy, and because she clearly articulated her strategy at each intervention meeting, development and modifications from this meeting on were done orally.

III. Jennifer's Strategy modification in Intervention #5 (from field notes)

Strategy	Code
1. Research	
2. Planning a. make definition and rough notes first b. find 2-3 main points- how notes interconnect c. going through notes and fit them into the sections *d. number points in notes to help figure out what section they belong in* e. make sure that you have good titles that connect back to the topic f. talk to your stuffed animals as if you were explaining it to someone	O/C
3. Make plans a. make a preliminary plan with an overview of the theme and main points/links and subpoints/ links b. make a detailed plan with sentences as points and links between points built in - make points in order - tie back to main points - link sentences to create a flow - build definitions into the sense of the text	
4. Translate plans into an essay with paragraphs and formatting	

ANNOTATION: Intervention #5

At this session, Jessica implemented her strategy when planning her first essay (for psychology). Based on the discussion of her implementation of the strategy in this case, she described one step to be added to her strategy (O/C).

IV. Jennifer's Strategy Modification in Intervention #12 (from field notes)

Strategy	Code
1. Research	
2. Planning	
a. make definition and rough notes first	
b. find 2-3 main points- how notes interconnect	
c. going through notes and fit them into the sections	
d. number points in notes to help figure out what section they belong in	
e. make sure that you have good titles that connect back to the topic	
f. talk to your stuffed animals as if you were explaining it to someone	
3. Make plans	
a. make a preliminary plan with an overview of the theme and main points/links and subpoints/ links	
b. make a detailed plan with sentences as points and links between points built in	
- make points in order	
- tie back to main points	
- link sentences to create a flow	
- build definitions into the sense of the text	
4. Translate plans into an essay with paragraphs and formatting	
5. *Revise the essay*	O/C
a. reread the essay, make sure you are making your points clearly	O/C
b. read each word carefully to make sure you wrote what you meant to write	O/C
c. make sure the sentences flow	O/C
d. check grammar	O/C
e. check spelling and punctuation	O/C

ANNOTATION: Intervention #12

Prior to this session, Jennifer had implemented her strategy when writing her final essay, for her geography class. Once she had finished a good draft, she moved to editing her paper. In this session, Jennifer and the instructor collaborated to develop a revision strategy. At the end of the session, Jennifer outlined the steps she wanted to try out in future writing tasks (O/C).

A Chronicle of Joanne's Strategy Development

I. Joanne's Strategy at Pretest

Writing Business Letters Strategy Sheet	Code
1. *Find out what you're writing about*	R/P
2. *Make out points of specific things you want to include*	R/P
3. *Organize the points so they make sense*	R/P
4. *Write the letter- a rough first draft*	R/P
5. *Go back and read each sentence and paragraph. Change it until it makes sense.*	R/P
6. *Spell check, check format, check style*	R/P

ANNOTATION: Pretest

At her pretest session, Joanne described the strategy she currently used to write business letters. She orally outlined the six steps listed above, which were written down by the researcher on an initial strategy sheet (R/P).

II. Joanne's Strategy Sheet from Intervention #1

Writing Business Letters Strategy Sheet	Code
1. Find out what you're writing about	
2. Make out points of specific things you want to include	
• *Be more specific and to the point*	R/C
• *Read around for other points that go together*	R/C
• *Consider what you should and shouldn't include- what you need and not too much that's unnecessary for reader*	R/C
• *Consider the audience's point of view (who you are writing to)*	R/C
3. Organize the points so they make sense	
• *Looking again for points that go together*	R/C
• *Thinking about what the audience would want to hear (so not negative)*	R/C
• *# your points*	R/C
4. Write the letter- a rough draft	
5. Go back and read each sentence and paragraph. Change it until it makes sense.	
• *Go back to the points all the time, to see if you missed at the time*	R/C
• *Keep rereading word by word- go slower*	R/C
6. Spell check, check format, check style	

ANNOTATION: Intervention #1

At this session, Joanne implemented her strategy while writing a first letter. She and the instructor discussed how well her current methods helped her produce a good letter, and alternative methods she might employ to better reach her goals. At the end of the session, Joanne reflected on the methods she had tried, and dictated to the researcher those that she wanted to try out when writing future business letters. The researcher recorded those on the strategy sheet (R/C).

III. Joanne's Strategy Sheet from Intervention #2

	Code
Writing Business Letters Strategy Sheet	
1. Find out what you're writing about	
2. Make out points of specific things you want to include • Be more specific and to the point • Read around for other points that go together • Consider what you should and shouldn't include- what does the reader need to know? • Consider the audience's point of view	
3. Organize the points so they make sense • Look again for points that go together • Think about what the audience would want to hear (not negative) • Number your points	
4. Write the letter- a rough draft • *Try to be less complex- more like how you talk- more direct* • *Keep in mind what you're writing about- reread and keep in mind the whole picture*	R/C R/C
5. Go back and read each sentence and paragraph. Change it until it makes sense. • Go back to the points all the time, to see if you missed at the time • Keep rereading word by word- go slower	
6. Spell check, check format, check style • *Have someone proof read if necessary*	R/C

ANNOTATION: Intervention #2

In this intervention, Joanne finished writing her first letter. Based on the discussion of the effectiveness of her current approaches and possible alternatives, Joanne added several more steps to her strategy. She dictated these to the researcher, who recorded them on the strategy sheet (R/C).

IV. Joanne's Strategy Sheet from Intervention #4

Writing Business Letters Strategy Sheet	Code
1. Find out what you're writing about	
2. Make out points of specific things you want to include • Be more specific and to the point • Read around for other points that go together • Consider what you should and shouldn't include- what does the reader need to know? • Consider the audience's point of view	
3. Organize the points so they make sense • Look again for points that go together • Think about what the audience would want to hear (not negative) • Number your points	
4. Write the letter- a rough draft • Try to be less complex- more like how you talk- more direct • Keep in mind what you're writing about- reread and keep in mind the whole picture	
5. Go back and read each sentence and paragraph. Change it until it makes sense. • Go back to the points all the time, to see if you missed at the time • Keep rereading word by word- go slower	
6. Spell check, check format, check style • Have someone proof read if necessary • *Look back on references for examples* • *Commas: use a 'pause'- read sentence and where you pause, you usually need a comma* • *Look for sentences that can be broken up*	 R/C R/C R/C

ANNOTATION: Intervention #4

After applying the strategy when writing a second business letter, Joanne and the researcher discussed possible methods for checking her final draft. Joanne added three more steps to her strategy: she dictated the steps to the researcher, who wrote them down on the strategy sheet (R/C).

V. Joanne's Strategy Sheet from Intervention #6

	Code
Writing Business Letters Strategy Sheet 1. Find out what you're writing about 2. Make out points of specific things you want to include • Be more specific and to the point • Read around for other points that go together • Consider what you should and shouldn't include- what does the reader need to know? • Consider the audience's point of view 3. Organize the points so they make sense • Look again for points that go together • Think about what the audience would want to hear (not negative) • Number your points 4. Write the letter- a rough draft • Try to be less complex- more like how you talk- more direct • Keep in mind what you're writing about- reread and keep in mind the whole picture 5. Go back and read each sentence and paragraph. Change it until it makes sense. • Go back to the points all the time, to see if you missed at the time • Keep rereading word by word- go slower 6. Spell check, check format, check style • Have someone proof read if necessary • Look back on references for examples • Commas: use a 'pause'- read sentence and where you pause, you usually need a comma • Look for sentences that can be broken up • *Grammar- check back to Chapter 21 for grammar and examples*	R/C

ANNOTATION: Intervention #6

At this session, Joanne added one more step to her revising strategy, based on her discussion of methods with the researcher. She dictated the step to the researcher, who wrote it down on the strategy sheet (R/C).

VI. Joanne's Strategy Sheet from Intervention #7

Writing Business Letters Strategy Sheet	Code
1. <u>Find out what you're writing about</u>	
• ***Read slow, listen to each word***	
• ***If you don't understand what you are going to write about, reread it again and again.***	S/I S/I
2. <u>Make out points of specific things you want to include</u>	
• Be more specific and to the point	
• Read around for other points that go together	
• Consider what you should and shouldn't include- what does the reader need to know?	
• Consider the audience's point of view	
3. <u>Organize the points so they make sense</u>	
• Look again for points that go together	
• ***Depends on the situation of the letter***	
• Think about what the audience would want to hear (not negative)	S/I
• Number your points	
4. <u>Write the letter- a rough draft</u>	
• Try to be less complex- more like how you talk- more direct	
• Keep in mind what you're writing about- reread and keep in mind the whole picture	
5. <u>Go back and read each sentence and paragraph. Change it until it makes sense.</u>	
• ***Reread the original materials (e.g. correspondance or cases)***	
• Go back to the points all the time, to see if you missed at the time	S/I
• Keep rereading word by word- go slower	
• ***Ask yourself, does it make sense, not just to you, but to someone else***	S/I
6. <u>Spell check, check format, check style</u>	
• Have someone proof read if necessary	
• Look back on references for examples ***(in book or correspondance)***	
• Commas: use a 'pause'- read sentence and where you pause, you usually need a comma	S/I
• Look for sentences that can be broken up	
• Grammar- check back to Chapter 21 for grammar and examples	

ANNOTATION: Intervention #7

During this session, Joanne reviewed and revised her strategy sheet independently, based on her experiences with letters she had written outside of the intervention context, and on reading she had done for her class (S/I).

A Chronicle of Nancy's Strategy Development

I. Nancy's Strategy Sheet from Intervention #3

	Code
A. Understanding the base / or format of the assignment	S/C
1) Read format and analize every sentence	S/C
2) Pick apart every sentence until it makes clear sense	S/C
3) Once I have a clear understanding of the first sentence, underline or make a note of the important piece	S/C
4) go on to the next sentence and repeat #3 until the whole paragraph is understood.	S/C
B. Taking Notes	S/C
1) Once all of the Base is understood	
**3) Take my notes on the base of the assignment and think of way I am going to organize idea's on paper.*	S/C
4) Work on my final copy.	S/C
2) fined Information on the assignment, and make them into notes. (Brainstorm).	S/C
Picture in head to see if it is clear to someone else	O/I

ANNOTATION: Intervention #3

In two previous intervention sessions, the instructor and Nancy had collaborated to work through her first assignment. At the end of this meeting, Nancy reflected on the task and processes used, and wrote down a strategy to try in future tasks. The steps in sections A & B were written by the student in her own words, based on the collaboration with the instructor (S/C) This was Nancy's first strategy sheet.

At the beginning of this session, Nancy described a new strategy she had tried at home when proofreading her writing: she pictured what she had written in her head to determine whether it would be clear to someone else. This was an orally described, student initiated strategy (O/ I).

II. Nancy's Strategy Sheet from Intervention #5

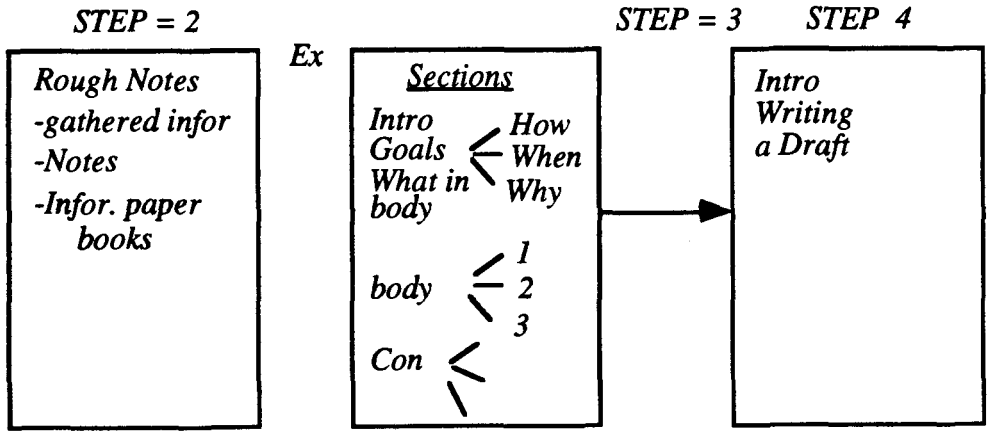
Code

A. Understanding the base / or format of the assignment
1) Read format and analize every sentence
2) Pick apart every sentence until it makes clear sense
3) Once I have a clear understanding of the first sentence, underline or make a note of the important piece
4) go on to the next sentence and repeat #3 until the whole paragraph is understood.

B. Taking Notes
1) Once all of the Base is understood
*3) Take my notes on the base of the assignment and think of way I am going to organize idea's on paper.
4) Work on my final copy.
2) fined Information on the assignment, and make them into notes. (Brainstorm).

Picture in head to see if it is clear to someone else

(B) Rewrite the notes in Sections that are going to help you answer the questions for the assignment — S / C



S / C

ANNOTATION: Intervention #5

During this meeting the researcher and Nancy began to work through a different assignment (assignment #6). At the end of this meeting, Nancy reflected on the processes used to write this new assignment, and refined her strategy. She elaborated point B3 and added a graphic depiction of the strategy steps. These steps were written by the student in her own words, based on the collaboration with the instructor (S/C)

III. Nancy's Strategy Sheet from Intervention #6

	Code
A. Understanding the base/or format of the assignment. 1) Read the format and analize each sentence. 2) Break each sentence down, until it makes clear sense. 3) Once you have a clear understanding of the sentence. Underline or make note of the important piece. 4) Go on to the next sentence and repeat #3 until the whole assignment is understood. B. Taking Notes 1) Once you understand the base of the assignment 2) Next to find information on the assignment, and make them into notes. (Brainstorm). 3) Take the notes on the base of the assignment and think of a way your going to organize this on paper. Example #3 Rewrite the notes in sections using only the notes that are going to help you answer the question for the assignment. Step 2 -Rough Notes -Gathered Inf. -Books -Papers -Observations → 5 - 3 → Sections Intro Goals Body Con → Start Writing a Draft *4) Work on the final copy using step-3 and Notes from step 2.*	S/I

ANNOTATION: Intervention #6

At the end of this intervention session, Nancy and the instructor continued to work on assignment #6. At the end of the session, Nancy chose to rewrite her strategy, summarizing the steps more completely. She rewrote the strategy in her own words. She also independently added one step: describing how she related her interpretation of the assignment sheet (the "base") from step-3 to her notes in order to derive an organization for her final draft. This added step was initiated by the student and described in her own words (S/I).

A Chronicle of Linda's Strategy Development

I. Linda's Strategy Sheet from Intervention #3

Strategy	Code
Building Conceptual Knowledge	R/C
1. Going through notes- trying to really understand conceptually what is going on	R/C
- keep reading through before class	R/C
- write them up	R/C
2. Go through text to add in other bits	R/C
3. Try to problem solve- once you think you understand- if stuck- target questions and go back to the notes	R/C
	R/C
	R/C
Going through notes	
-pull out conceptual points initially	
relate it to the examples	R/C
linking it back to previous work	R/C
	R/C
	R/C

ANNOTATION: Intervention #3

In this session, the instructor and Linda went through a set of notes to build a conceptual understanding of the course material. At the end of the session, Linda reflected on what she had done, and defined a strategy that she could use in future studying. She dictated the steps in her own words, and the researcher wrote them down. These steps were based on the collaboration with the instructor, and were coded as (R/C).

II. Linda's Strategy Sheet from Intervention #5

Statistics Problem Solving	Code
Part I: Building Conceptual Knowledge	
1. ~~Go through~~ notes- trying to really understand conceptually what is going on.	S/I
- keep reading through before class- *text*	S/I
- write them up *from class and text*	S/I
- *while* going through notes:	S/I
- pull out conceptual points initially	
- relate it to the examples	
- linking it back to previous work	
2. Go through text to add in other bits	
3. Try to problem solve, once you think you understand. If stuck, target questions and go back to the notes.	
Part II: Problem Solving	
1. Start from the basics- use exactly what is given	S/C
2. Draw out or reword question so understand what is being asked	S/C
3. Use information to solve question keeping it simple	S/C

ANNOTATION: Intervention #5

At this session Linda and the instructor began to develop a strategy for problem solving. After working through problems, Linda reflected on what she had done and defined a series of steps that she would use in future problem solving tasks. These steps were based on the collaboration with the instructor, and were written by the student (S/ C). She also independently edited her strategy for building conceptual knowledge. These changes were coded as (S/I).

III. Linda's Strategy Sheet from Intervention #9

	Code
Statistics Problem Solving	
Part I: Building Conceptual Knowledge	
1. ~~Go through~~ notes- trying to really understand conceptually what is going on. - keep reading through before class- text - write them up from class and text - while going through notes: - pull out conceptual points initially - relate it to the examples - linking it back to previous work	
2. Go through text to add in other bits	
3. Try to problem solve, once you think you understand. If stuck, target questions and go back to the notes.	
Part II: Problem Solving	
1. Start from the basics- use exactly what is given 2. Draw out or reword question so understand what is being asked 3. Use information to solve question keeping it simple 4. *- Recheck answer to ensure the interpretation is correct and the whole question is answered*	S/C

ANNOTATION: Intervention #9

During this session, Linda and the instructor worked again on solving problems. At the end of the session, Linda decided to add one step to her problem solving strategy, based on the collaboration, and wrote it in her own words (S/C).

A Chronicle of Kathy's Strategy Development

I. Kathy's Strategy Sheet from Intervention #1

Strategies	Code
1. *Break it down into chunks*	R/C
2. *Concentrate on each chunk without going on* *Use study guide to answer questions*	R/C R/I
3. *Summarize before going on*	R/C

ANNOTATION: Intervention #1

During the first intervention meeting, Kathy and the instructor started by reading the introduction to an article. After reflecting on the methods she used, Kathy defined the following steps she would try in future reading tasks. She dictated the steps to the researcher, who wrote them down. Three of these steps were derived from the collaboration with the instructor (R/C). The last was an idea that Kathy had, based on what she had tried over the previous weekend (R/I).

II. Kathy's Strategy Sheet from Interventions #3 & 4

	Code
What can I expect to understand?	S/C
What is the main idea?	S/C
Reading Strategy	S/C
1. Use title as a question for reading chapter or parts of chapter	S/C
2. Format -> decide how reading material is laid out for clues (or information on reading material)	S/C
What is the role of the following:	S/C
- Summary	
- Introduction- background/ history and slowely introduces present topic of study	S/C
- Body (sub-sections)	S/C
-stay focused on subsections	S/C
"Whenever you are approaching a reading task, keep in mind the roles of the section/format of the titles -> How is this going to help you focus on reading material?"	R/C

ANNOTATION: Intervention #3 & 4

During the third intervention session, the instructor and student read the introduction to another article. Based on this task, the student further defined the steps she could use while reading, and wrote them down in her own words (S/C). Steps added in this session are presented in standard typeface.

During the fourth meeting, the instructor and student tried using the strategy in the context of reading Kathy's textbook. Based on difficulties she encountered while reading, Kathy added two orienting steps to her strategy (S/C). Points added during the 4th session are italicized. Further, at the end of the session, Kathy dictated a statement to the researcher, which she asked be added to the bottom of her strategy sheet (R/C).

III. Kathy's Reading Strategy from Intervention #7a

	Code
WHAT ROLE DO THESE SUBSECTIONS PLAY?	S/C
1. Read Title	S/C
• *Obtain clue about reading task*	S/C
2. Review Format of Reading Material	S/C
• *Divide into Chunks*	S/C
3. Read Title (if any) of Chunks to obtain clue about Reading Task	S/C
4. When Reading <u>FOCUS</u> only on CHUNK	S/C
5. When you have Finished Reading Chunk- Ask yourself what the <u>MAIN IDEA</u> Is. (Interpret in your own words and then write it down)	S/C
6. After Reading whole Task try to <u>LINK</u> each <u>CHUNK</u>	S/C
7. If CHUNKS Become to Difficult to Focus On Divide CHUNKS Into Sub-CHUNKS and then LINK	S/C

ANNOTATION: Intervention #7a

During this intervention Kathy constructed another version of her main reading strategy. The emphasis in and organization of this strategy were entirely hers (S/C).

IV. Kathy's Strategy for Reading Articles from Intervention #7b

	Code
Purpose -> This will help me focus on what I am looking for	S/C
ARTICLES	S/C
"How they BUILD An Arguement	S/C
1. HYPOTHESIS -> Main Idea, Suggestion	S/C
"What They Are Investigating	S/C
2. METHODS -> How They Conducted The Experiment- Summarized	S/C
Main Idea	
3. PREDICTIONS -> Specifically	S/C
4. RESULTS - of subjects	S/C
5. CONCLUSIONS -> What the results mean	S/C
-> Infer from the results a more general claim	S/C

ANNOTATION: Intervention #7b

While reading a chapter on the origins of prejudice in her textbook, Kathy had difficulty summarizing a research study. Based on this difficulty, the instructor and Kathy worked to elaborate the 5th step in her reading strategy by defining the kinds of main ideas one might find in articles. Based on this discussion, Kathy wrote down a description of the format of an article in her own words (S/C).

V. Kathy's Time Management Strategy from Intervention #9

	Code
USE TIME MANAGEMENT TECHNIQUES TO PLAN OUT READING TIMES	S/I
-Plan to Read a Chapter throughout the week in 1-2 hour consistent CHUNKS with at least 2 hour intervals.	S/C

ANNOTATION: Intervention #9

At the beginning of this session, Kathy expressed a concern with how long her reading was taking her, and requested a time management strategy that would help her complete her reading more effectively (S/I). Based on a collaboration with the instructor, she decided to read in small, distributed chunks, rather than massing her reading into a single day (S/C). She recorded the strategy steps in her own words.

VI. Kathy's Strategy Sheet from Intervention #10

WHAT ROLE DO THESE SUBSECTIONS PLAY?	Code
1. Read Title • Obtain clue about reading task	
2. Review Format of Reading Material • Divide into Chunks • *Remember what each chunks purpose is, i.e.. intro*	S/C
3. Read Title (if any) of Chunks to obtain clue about Reading Task	
4. When Reading FOCUS only on CHUNK	
5. When you have Finished Reading Chunk- Ask yourself what the MAIN IDEA Is. (Interpret in your own words and then write it down)	
6. After Reading whole Task try to LINK each CHUNK	
7. If CHUNKS Become to Difficult to Focus On Divide CHUNKS Into Sub-CHUNKS and then LINK	

ANNOTATION: Intervention #10

During this session, Kathy decided fine tuned her strategy by adding one step, based on difficulties she encountered using the strategy, and the ensuing discussion with the researcher. The added step is italicized (S/C).

VII. Kathy's Strategy Sheet from Intervention #12a

WHAT ROLE DO THESE SUBSECTIONS PLAY?	Code
GOAL -> To subtrack Main IDEA	S/C
1. Read Title • Obtain clue about reading task	
2. Review Format of Reading Material • Divide into Chunks • Remember what each chunks purpose is, i.e.. intro	
3. Read Title (if any) of Chunks to obtain clue about Reading Task	
4. When Reading FOCUS only on CHUNK	
5. When you have Finished Reading Chunk- Ask yourself what the MAIN IDEA Is. (Interpret in your own words and then write it down)	
6. After Reading whole Task try to LINK each CHUNK	
7. If CHUNKS Become to Difficult to Focus On Divide CHUNKS Into Sub-CHUNKS and then LINK	

ANNOTATION: Intervention #12a

At this meeting Kathy decided to write an orienting statement at the top of her main reading strategy sheet, to help keep her focused while reading. This addition was based on a discussion with the researcher while applying the strategy when reading a different kind of article: one that presented a conceptual argument rather than a research report. Again, she made the addition in her own words (S/C).

VIII. Kathy's Strategy Sheet from Intervention #12b

RULE OF READING	Code
Your Strategic Approach Is In A Problem Solving Mode!	S/I
1. *GOAL* *-> To Subtrack Main Idea + Focus In Reading Task*	S/I S/I
2. *To Use Strategy To Aid In Focusing On And Subtracting Main Idea Behind Reading Task.*	S/I
3. *To Remind Myself That The Straegy CAN BE Flexible to Meet The Needs of Focusing and Subtracting The Main Idea.*	S/I
4. *To Develop New Flexible Outlines If Necessary To Aid In Focusing And Subtracting Main Idea (* Review Format)*	S/I
5. *If Comprehension Breaks down, Remember You Now May Have Problem -> Go Back To Your Strategies To Solve Problem, Then Proceed.*	S/I

ANNOTATION: Intervention #12b

Because Kathy had encountered difficulties when applying her strategy to a new type of reading task (the conceptual article), she developed this strategy to remind herself to use her main reading strategy in a problem solving and flexible manner. She independently initiated developing the strategy, and defined the steps on her own (without prior discussion with the researcher) (S/I).

IX. Kathy's Strategy Sheet from Maintenance Session #3

	Code
Main Idea- problem condensing Whole Book	S/I
Lecture- I am putting words that do not belong, repeat	S/I
Exam- Do not understand how to approach examine questions? Dif kinds.	S/I
What Kind of Book is it?	S/I
What is the task for this book?	S/I
How can your notes help?	S/I
When you find out the task, clarify what that means. ie critizm, comparison	S/I
-> *Critisim*	S/I
What is the role of a critisim	S/I
When you find out what this means apply this with the aid of lecture notes if it applies	S/I
-> *Look at Language used*	S/I
-> *Who is the authors audience*	S/I
-> *What is his/her arguement*	S/I
-> *Look for info about author*	S/I
-> *Do you agree/disagree what author is saying*	S/I

ANNOTATION: Maintenance Session #3

In the following semester, Kathy was enrolled in a sociology course where she had to write a criticism of a sociological novel. Three months after the intervention, she developed this strategy for herself to help her achieve that goal (S/I).

A Chronicle of Mike's Strategy Development

I. Mike's Strategy Sheet from Intervention #1

Orally Described Strategy (from the researcher's field notes)	Code
1. He's looking at little sections at a time in chapter.	O/C
2. He'll read one paragraph at a time.	O/C
3. He'll try to say it in his own words.	O/C
4. Then write it down.	O/C
Written Strategy	
Read the info one paragraph at a time, then go back, then right what was being said in that paragraph	S/C

ANNOTATION: Intervention #1

At this session, Mike and the researcher began to read Chapter 1 of his psychology textbook, and to discuss effective methods for enhancing his reading comprehension. Based on this discussion, Mike orally outlined a strategy that he could try in future reading tasks, while the researcher made a note of what Mike said in her field notes. Because these steps were described orally by the student and were developed based on the discussion with the researcher, they were coded as O/C.

At the end of the session, Mike also wrote down his perceptions of the strategy. Note, however, that Mike was very uncomfortable writing his strategy, and that the written version did not represent all of the steps Mike described orally. These steps were also based on discussion, but were written by the student, rather than described orally (S/C).

II. Mike's Strategy Development During Intervention #2 from field notes and transcripts

	Code
A. <u>Reading Chapter</u>	
1. *Focus not just on understanding paragraphs, but also on recognizing the links between ideas: the whole structure*	O/C
2. *Compare/ Contrast points and see relationships*	O/C
3. *Understand the arguments the authors are trying to make before moving beyond it, to make inferences*	O/C

ANNOTATION: Intervention #2

During this intervention meeting, Mike and the instructor read a section from chapter 1 in his psychology text, and discussed methods for reading more effectively. At the end of the session, Mike described the above steps as ones that he'd like to try for future sessions (O/C).

III. Mike's Strategy Sheet from Intervention #3

Written Strategy	Code
Read the section of..the head title	S/C
Try making a caniction in whats being said.	S/C
Try to find each section.	S/C
Then somerize each section.	S/C

ANNOTATION: Intervention #3

During this intervention, Mike wrote out the steps he wanted to follow when reading, based on discussion with the instructor of his reading of the first chapter in his text (S/C). Again, the steps Mike wrote down were not as articulated as the steps he described orally.

IV. Mike's Strategy Development During Intervention #4 from field notes and transcripts

	Code
A. Reading Chapter 1. Focus not just on understanding paragraphs, but also on recognizing the links between ideas: the whole structure 2. Compare/ Contrast points and see relationships 3. Understand the arguments the authors are trying to make before moving beyond it, to make inferences *4. Use charts and pictures as aids, not as a substitute for reading*	O/I

ANNOTATION: Intervention #4

Because Mike articulated his strategy well between sessions, without referring to written records, because he was very reluctant to express his ideas in writing, and because his written records of strategies failed to represent his approach, from this intervention meeting on, all of Mike's strategy developments and modifications were done orally. At this meeting, Mike described a strategy that he had used while reading in between sessions, and he and the researcher discussed the usefulness and limitations of using graphic aids in constructing an understanding of text (but not as a substitute for reading). Mike decided to add this to his strategy (O/I).

V. Mike's Strategy Development During Intervention #6 from field notes and transcripts

	Code
A. <u>Reading Chapter</u>	
1. Focus not just on understanding paragraphs, but also on recognizing the links between ideas: the whole structure	
2. Compare/ Contrast points and see relationships	
3. Understand the arguments the authors are trying to make before moving beyond it, to make inferences	
4. Use charts and pictures as aids, not as a substitute for reading	
5. *Look for clues as to what is important (e.g., stressed words, linking ideas across sentences, signaling words).*	O/C
6. *Clarify unclear words that are important to comprehension*	O/C

ANNOTATION: Intervention #6

At this session, Mike and the researcher fine tuned the reading strategy after applying the strategy to reading a segment of chapter 2. At the end of the session, Mike described two steps he thought he should add to his strategy, based on this discussion (O/C).

VI. Mike's Strategy Development During Intervention #7 from field notes and transcripts

	Code
A. Reading Chapter	
1. Focus not just on understanding paragraphs, but also on recognizing the links between ideas: the whole structure	
2. Compare/ Contrast points and see relationships	
3. Understand the arguments the authors are trying to make before moving beyond it, to make inferences	
4. Use charts and pictures as aids, not as a substitute for reading	
5. Look for clues as to what is important (e.g., stressed words, linking ideas across sentences, signaling words).	
6. Clarify unclear words that are important to comprehension	
B. Studying Text Information	
1. Read once to understand main direction	O/I
2. Read again, each paragraph, making links	O/C
3. Write on each topic	O/C
4. Reread notes	O/C
5. Repeat in his head to see how that works	O/C
6. Link with everything	O/C

ANNOTATION: Intervention #7

In this session, the researcher and Mike turned their attention to developing a strategy for studying (learning) the information Mike now comprehended better as he read. Mike reported that he preferred to read an entire section first, before breaking it down into pieces or trying to study it more thoroughly, and built this step into his strategy (O/I). Then he and the instructor collaborated to define and evaluate other possible approaches. At the end of the session, Mike described a series of steps he would try out before the next session (O/C).

VII. Mike's Strategy Development During Intervention #11 from field notes and transcripts

	Code
A. Reading Chapter	
1. Focus not just on understanding paragraphs, but also on recognizing the links between ideas: the whole structure	
2. Compare/ Contrast points and see relationships	
3. Understand the arguments the authors are trying to make before moving beyond it, to make inferences	
4. Use charts and pictures as aids, not as a substitute for reading	
5. Look for clues as to what is important (e.g., stressed words, linking ideas across sentences, signaling words).	
6. Clarify unclear words that are important to comprehension	
B. Studying Text Information	
1. Read once to understand main direction	
2. Read again, each paragraph, making links	
3. Write on each topic	
4. Reread notes	
5. Repeat in his head to see how that works	
6. Link with everything	
C. Learning New Terms	O/C
1. Study- learn- pronounce properly	O/C
2. Write on paper	O/C
3. Look at the correct word	O/C
4. Repeat and practice	O/C

ANNOTATION: Intervention #11

Because Mike had particular difficulty learning unfamiliar terminology (e.g. amygdala), he and the instructor decided to pay particular attention to methods that might help him remember terms more effectively. Based on this collaboration, Mike decided to adopt a four step strategy for learning terms (O/C).

VIII. Mike's Strategy Development During Intervention #12 from field notes and transcripts

	Code
A. Reading Chapter 1. Focus not just on understanding paragraphs, but also on recognizing the links between ideas: the whole structure 2. Compare/ Contrast points and see relationships 3. Understand the arguments the authors are trying to make before moving beyond it, to make inferences 4. Use charts and pictures as aids, not as a substitute for reading 5. Look for clues as to what is important (e.g., stressed words, linking ideas across sentences, signaling words). 6. Clarify unclear words that are important to comprehension B. Studying Text Information 1. Read once to understand main direction 2. Read again, each paragraph, making links 3. Write on each topic 4. Reread notes 5. Repeat in his head to see how that works 6. Link with everything C. Learning New Terms 1. Study- learn- pronounce properly 2. Write on paper 3. Look at the correct word 4. Repeat and practice 5. *Visualize the term in your head*	O/I

ANNOTATION: Intervention #12

In this session, Mike described a step he had added to the strategy when trying the approach between sessions, and added this step to the strategy (O/I).

APPENDIX 3
Scoring Criteria for Writing Samples

I. Evaluating writing assignments from an ECE program (Nancy).

Theme	5	• Clearly references questions immediately and targets answers to the assignment or questions asked throughout the response
	4	Indirect reference to questions but answer consistently targeted to the question/ assignment throughout the response
	3	The answer hangs together and overall responds to the question/assignment, but you have to figure out the link
	2	• Answer is related to the question but doesn't really answer the question directly, choppy and hard to follow how each section relates to each other or the overall theme
	1	• Answer does not respond to the question
Organization	5	• Presents ideas logically and in order without jumping around
	4	• Has sections but jumps around within sections
	3	• Has sections but jumps around between sections
	2	• Ideas seem related but no clear organization (stream of consciousness)
	1	• No apparent relationship between ideas or tie in to theme: no organization between sentences
Idea Flow	5	• Clear transitions between all sentences and all paragraphs, no sense of waiting to see where she is going or what the link is between sentences
	4	• Can follow flow, but some gap between sentences, not a smooth flow in between
	3	• Relationship between sentences is choppy, but you can figure it out: sentences relate to each other in terms of the ideas expressed given the current topic being discussed (e.g. they tie in to some theme in a paragraph or section)
	2	• Hard to understand relationship between sentences, but they relate to the same topic generally ("big picture" or overall theme)
	1	• No clear relationship between ideas from one sentence to the next either in transition or in terms of the topic addressed
Clarity	5	• Each sentence stands on its own and expresses an idea clearly
	4	• Can figure out meaning of sentence, but minor choice of words, construction problems make it a bit off
	3	• Can figure out the meaning of sentences with some effort- ideas not succinctly expressed. Need context to clarify meaning
	2	• Hard to figure out meaning- sentence not very clear in expression of idea
	1	• Sentences make no sense, can't figure it out at all.

II. Evaluating business letters (Joanne).

Theme	5	Explicitly sets up theme clearly in the introduction and follows the theme throughout the letter. The reader knows immediately and clearly the purpose of the letter
	4	• Sets up theme a bit indirectly in the first paragraph and follows it consistently throughout
	3	• Get an idea of the theme by reading the letter- hangs together, but not clear in the first paragraph
	2	• Jumps between ideas, hard to get a clear sense of the theme throughout the letter
	1	• No clear theme or coherence to the letter
Organization	5	• A clear introduction, body, and tie up to the letter. Each paragraph or section has a clear purpose and hangs together. Similar theme/ ideas grouped together in paragraphs or sections
	4	• Generally organized but some jumping around *within* paragraphs or sections
	3	• Can understand the organization, but it's choppy. Ideas bounce around between sections
	2	• Ideas seem related but no clear organization (stream of consciousness), no break up into clear sections
	1	• No apparent relationship between ideas or tie in to theme: no organization between sentences
Idea Flow	5	• Clear transitions between all sentences and all paragraphs, no sense of waiting to see where she is going or what the link is between sentences
	4	• Can follow flow, but some gap between sentences, not a smooth flow in between
	3	• Relationship between sentences is choppy, but you can figure it out: Sentences relate to each other in terms of the ideas expressed given the current topic being discussed (e.g. they tie in to some theme in a paragraph or section)
	2	• Hard to understand relationship between sentences, but they relate to the same topic generally ("big picture" or overall theme)
	1	• No clear relationship between ideas from one sentence to the next either in transition or in terms of the topic addressed
Clarity	5	• Each sentence stands on its own and expresses an idea clearly
	4	• Can figure out meaning of sentence, but minor choice of words or construction problems hinder understanding slightly
	3	• Can figure out the meaning of sentences with a little effort- ideas not succinctly expressed. Need context to clarify meaning
	2	• Hard to figure out meaning- sentence not very clear in expression of idea
	1	Sentences make no sense, can't figure it out at all.

III. Evaluating first year university essays and exams (Jennifer).

Theme	5	• Explicitly lays out the theme clearly in the introduction and follows throughout the essay/question.
	4	• Sets up the theme a bit indirectly within the introduction and follows it consistently throughout
	3	• Get an idea of the theme by reading the essay, it hangs together, but need to figure it out. Not clearly presented in the introduction.
	2	• Some common content in each section (some thread), but very choppy and hard to follow. No clear theme set out.
	1	• No theme apparent- a different topic in each paragraph instead of a coherent discussion of a topic. No clear connections.
Organization	5	• Essay: A clear introduction, body, and conclusion to the essay. Each paragraph/ section has a clear purpose and hangs together. Similar theme/ ideas grouped into paragraphs. Exam: Presents ideas logically and in order without jumping around.
	4	• Essay: Generally organized but some jumping around within sections. Exam: Sectioned but jumps within sections.
	3	Essay: Can understand the organization, but it's choppy. Ideas bounce around between paragraphs or sections. Exam: Has an organization, but bounces around between sections.
	2	• Essay or Exam: Ideas seem related but no clear organization (stream of consciousness), no break up into clear sections
	1	• Essay or Exam: No apparent relationship between ideas or tie in to theme: no organization between sentences
Idea Flow	5	• Clear transitions between all sentences and all paragraphs, no sense of waiting to see where she is going or what the link is between sentences
	4	• Can follow flow, but some gap between sentences, not a smooth flow in between
	3	• Relationship between sentences is choppy, but you can figure it out: Sentences relate to each other in terms of the ideas expressed given the current topic being discussed (e.g. they tie in to some theme in a paragraph or section)
	2	• Hard to understand relationship between sentences, but they relate to the same topic generally ("big picture" or overall theme)
	1	• No clear relationship between ideas from one sentence to the next either in transition or in terms of the topic addressed
Clarity	5	• Each sentence stands on its own and expresses an idea clearly
	4	• Can figure out meaning of sentence, but minor choice of words or construction problems hinder understanding slightly
	3	• Can figure out the meaning of sentences with a little effort- ideas not succinctly expressed. Need context to clarify meaning
	2	• Hard to figure out meaning- sentence not very clear in expression of idea
	1	• Sentences make no sense, can't figure it out at all.

APPENDIX 4
Students' Adaptation of Strategies for Use in Different Tasks

I. Jennifer

Posttest Session

J: It's helped me in my note taking too, just helped me pick out, like, because I'm so concentrating on flow, I can pick up on other people's flow now. So like, you know, the teacher's going on, I no longer write down like, scribbling madly about every single point he makes, but I can almost summarize and just, it's getting, my essay writing, my note-taking is better now.
R: So, can you elaborate on that a bit, so how do you think it's helped you with that?
J: Basically because I'm so concentrating on flow and what the flow is from all my essays, I find it's easier for me to pick that out now. In other people, like when my professors are talking. What exactly is the main point of everything, or what, how does that link to the last thing, and, basically it's a lot easier to write notes that way, than just kind of blindly, just scribbling down every word he says without listening.
...
J: Hm..I have better organizational skills now.
R: In what way?
J: Well, I mean cause now I know how to get organized for an essay, like, what I have to have to get to a certain point, and what I need to do at a second point. Just, I do that all the time now. Like, if I know to, for like a final exam, first I have all, I have to have all my rough notes, then I have to have more of a general idea, then a more specific idea, then to the point where I can almost, you know, write an essay about everything I've learned.
R: Um huh
J: So it's kind of that point, where I just use that strategy with all my schooling, going from very general, to working up to more specific, just on everything

II. Joanne

Intervention #6

J: I'm wondering if working with this, and me working with when to pause and not will help me with my transcription. You know, like, the idea of when to use the comma, when not to, like, I mean the pausing whole thing, and maybe just listening to the sentences itself now, more, cause I know more about how the letters, you know, maybe when they start, they just start out with like, OK, Dear Mr. Polovas, further to your, they do the same thing, right? Maybe it'll, like, and they don't tell you where to put a comma or not
R: So, maybe, that's part of your problem with transcribing, so maybe knowing this now, that'll help you
J: That's what I mean, it's like, that's what I'm kind of hoping for
...
J: I still think that everything that I learn here, it still has an effect on everything after. It does.
R: Yah, I think so
J: Like, the transcription, like, that's what I do, like they give me tapes at work, but very seldom do they, because I complain too much about doing them. Um, even when I did it, I guess I did a tape for work about two weeks ago, and I found it easier to do it, than I did before.
R: Good
J: Just because I think, you know, he was saying, and I kind of knew what he was talking about, you know, because it was on a file that I do, but, just the sense that I, kind of, like before, if I couldn't hear him, it's more like, I knew, because it went together with the, you know, like, everything flowed together, so obviously that's the word you want to use, but before, when I didn't know that, it was harder to understand
R: Right
J: So it does help, doing the strategy for the letters, knowing how to do a letter, and listening to someone else do a letter, it all falls into place easier.

Intervention #8

J: Oh yah, like, I do it at work all the time, like, lately, actually, from well, from what, like you've been helping me on that stuff, I can write letters now, without, like, they just tell me what they say, like, well can you write a letter to so and so about, blah, blah, blah, blah, right? I can do it now, and I can, I have no problem. There's no corrections at all. They don't, the phrasing that I use, what I say, they like it.
R: Good
J: Right, so this, that is new to me. Like, that does not happen. I never had that before. Where they'd say, 'well, gee, you know, you've kind of messed it up here', so they'd rewrite it for me right? But now I just do the letters, and they're all, they're all different but they're not standard or anything like that, and they sign it right away. They have no problems with it.
R: Great.
J: So this is what I mean, this is kind of.
R: Well the thing is, so clearly you're seeing that you've made progress at work
J: Oh yah, like, even, even like, when my mother, she, cause she's an MBA comes up there, she came up there, and I was like, oh god, oh my god. And I did this letter, and she was like really impressed, because from what she knew of all the stuff that I did, I never, I wasn't, never able to do that.
R: Yah
J: You know like, they just, now like, before, well most of them would know that, I'd say, well, can you just kind of tell me what you want, and I'd be writing down really fast what they'd be saying? Right? And now they say, well do this, this, and this, and I want a letter to so and so, and I want it about this, and there I go, I just, I mean, sure I sit there and think about it for a while, but, it comes out. You know, it's no problem, but with these bloody things, you have to make up something.
R: Yah
J: Like, you don't know what they want. Or maybe it's just because the information to me is so different compared to what I do everyday, I don't know what it is.

III. Linda

Intervention #6

L: Which is good. But it's also, in fact this is, this strategy of targeting with this, is transferring. I mean, I haven't hardly done anything else, except, stats. And I've been doing all my testing for my pilot work. But now I'm actually getting into doing my analysis, and I've actually had to get on with my own reading. And having to put this presentation together. But I found myself this morning and last night going in and just whipping through the papers and focusing straight in to try and pull out exactly what I wanted. So I'm, you know, it's great

R: Would you have done that before?

L: Um, no, not as efficiently.

R: Oh, good

L: Yah, so it's good. Because, I'm reading journals. I'm, you know, sort of sit there and spend hours and then make notes and exactly the same as what I was doing with the stats. And not pulling out, just the main points which I needed, and, OK, so there's loads of other points, but it, they're not important at the moment, you know, I can always go back to those. So, that's great, because I mean it's, it means that all my work's becoming more efficient. Which is good

R: That's excellent

L: It should save me a lot of time. So I can go out and party more now.

IV. Kathy

Intervention #9

K: One of the things too, that I've found, that the strategy works for, is, um, you know, I'm going to apply some of this strategy to trying to um, when I listen to, um, a lecture.
R: Oh, and how are you going to do that?
K: Well, because a lot of our lecture has to do with the articles.
R: Hm..
K: So I'm going to try to um, OK, it's talking about the hypothesis now, write that down, and then, because I'm scattered, I can't, you see, he talks, you know, talking is different than reading, and he's going at, I don't know, 200 words a minute. It's very difficult for me to, to process it. Because sometimes I'm very stuck on words.
R: Right
K: What does that word mean, or, how do I spell it. And I'm just thrown right off.
R: Right.
K: So this might help me get back, focus.
R: So it's going to guide you to
K: I'm going to try it, I'm going to try it today.
R: Good idea.
K: OK, so, here I'm coming up with another strategy.

Posttest Session

K: Because as I was just doing your exams today, I was, I had to keep telling myself main idea, main idea, main idea. At first I wasn't doing it. When I first read that. And I had to go, oh, main idea. Now, you have to learn that until it becomes a little bit more automatic
...
K: But I actually knew, you know, like, you see I was thinking main ideas all the time. Like, that main idea. What was the main idea. And I didn't worry about, that's all I had to know.
R: Yah
K: So I kept that in the back of my mind. Because before, you see, I, I talked on a business topic, I can't remember what it was. I understood it. But I was scattered.
R: Yah
K: So this sort of gave me, you know, thinking with the strategy in mind,
R: Yah
K: I sort of thought about it, you know, and used it, to, I guess I flexed it a bit.
R: Good. OK
K: To use it in a presentation situation. You know.

V. Mike

Intervention #4

M: And I can see it actually working for me now with my other courses too.
R: Yah? And how?
M: And, I'm reading, well, for my English right? I'm reading it and I'm understanding it a lot better, cause I'm reading each paragraph at a time too, for my courses
R: Oh good
M: For my, each paragraph that we're talking about right? And I'm talking it over, and I'm saying, OK, well, yah, I can see the relevance with that, right?
R: Good. Well, that, and that's something to do as we're working, that's excellent, try to make links to the other stuff that you're reading in your other courses, cause that's right. The idea here is a general one that should be good across, and that will help you with your strategy too.
M: I'm even doing that with my math even, right? Cause with the explanation of, when they're, in the beginning? They show a whole introductory of what's going to be taught, or, before you do your exercises, right? So you read it, and, that's what I'm doing, is I'm reading each one of them, and then I'm doing the margin questions, right?
R: Yah
M: Cause that, the margin questions, there's margin questions on the side, when they're doing the explanation, and, I'm checking this, and say, OK, yah, OK, yah, I understand that. And going back and forth.

Intervention #7

M: Well, you know, yah, that's, it's helping me in my paragraph writing also. By, able to read the paragraph, and you were saying, how to read, how they were going to be setting up.
R: Um huh
M: And it's really interesting, cause I'm using that same kind of method in my paragraph writing. Yah, I can see the relation with it right?
R: Um huh
M: So it's really good that way.
R: So how are you using it, how does it apply to your paragraph writing?
M: Like, remember we were saying, that, there's always going to be a sentence that's going to be describing what they're going to be talking about? And um, that's what I'm doing right now. I'm going to say, OK, this is what I'm going to be talking about. And then I would start, I would say, OK, these are the three steps, or four steps or whatever, right?
R: Good
M: And that's why, that's how I, I kind of interrelate with that, with this, right? Cause, this was the same thing, but in essay form, in a way, right?
R: Right
M: So they're going, this, they're going to say in the first paragraph, OK, we're going to be talking about this and this and this. And then they're going to say, OK, well, this is what, you know what I was talking about in there.
R: Excellent. OK. That, I think that's a good parallel.
M: Cause you need reasons, right? There's always something, reasons behind everything they're going to be talking about. You need a reason, and a statement to back it up, right? And that's, the same things that we were talking about here, so that's something I can be looking into, right?
R: Yah, exactly, exactly. And it's kind of the whole idea that writing, whether you're doing it or they're doing and you're reading it
M: Yah
R: Have that kind of a sense of explaining something
M: Yah, yah, it's true.

V. Mike (cont'd)

Intervention #11

M: Well, I have been, you know, I think you know this probably helped a lot too on my studying in my math, too.
R: Um huh, how?
M: Because I have, I've done, I've been doing really well in my math lately. And I've been using the methods, also in my math, right?
R: Hm. So what method are you using in your math?
M: Well, I'm doing the work, right? And then I'm going back on it, and then repeating it again, but, just like visualizing it and see if I could do it. And then I would just do other questions, like, the hardest questions I would look at, and say, OK, well, let me see if I can do this, right?
R: So sort of testing yourself?
M: I'm testing myself yah. Retesting, and then looking, reading it, right?
R: Hm, great, OK. So you feel like that's helping you a bit then too.
M: Yah, and also, you know, I'm reading the word questions quite well too. Because I think what I'm doing is I'm actually reading it, the way, the what they're meaning exactly, right? Not like, well, you know, it could be like, doing this, flying around in a circle.
R: OK, so that comes from our strategy where you're reading each sentence
M: Yah, cause I mean, look how well I'm doing right now in my math, right? I'm getting about 100% on stuff.
R: Hm. Great. That's good. Well, I'm glad.

V. Mike (cont'd)

Posttest Session

M: But you know, I applied my methods also to my, like, remember I was telling you I applied my methods, to my, for my work too? My school work? And I could see, I saw the results right? In my math, algebra, I had, in my grade 10, I had two B's right, ... So, like the first section I did for grade 11, I received a B. And the second, after we started meeting and doing our processing stuff, I received an A for my final grade
R: Good. So you
M: So I mean, I guess I progressed right there, right?
R: Um huh, that's good. And why do you think that happened?
M: Well, just from the studying methods I was um, I put towards my studying.
R: In what, concretely, like in your math, how did you use it in math?
M: Well, I um, I talked about it more, with more people I guess. I did talk, I did do some more studying with other people. And that really did help a lot too.
...
M: And the terms and stuff, I, I, I tried to remember the terms also by visualizing it, and then, you know, writing it out too. Cause there were some terms that, I, I didn't get, like the formulas and stuff. Well, the formulas, I wrote them out, and then I tried to remember, I'd say, um, B = whatever, right? And then I did it that way. I remembered it.
R: That's good.
M: I was actually really surprised I was able to remember those formulas. Cause I'm really bad at remembering things, right. And yah, I did really well on that, on those.
R: Yah, that's good.
M: I was the second highest in my class, I had a 95% average. That was my, my final mark.
R: That's great. I'll make a note of that, cause that's important too, cause I'm glad that you're seeing, that the kinds of things we worked on for this, it's just, it was just sort of for practice, but for that, that's a real life application
M: Yah
R: I'm really pleased.
...
M: Well, yah, I mean that's, that was really, I was like shocked right? I've never received that high of a mark, ever, you know. That's pretty good. 95%, I'm going why, that's only 5% lower than 100%.
...
M: Yah, like I mean, like for my math, I didn't make any connections for a while, right? I was just working the way it was going. I didn't like put, in math, everything is connected, right? It's a building block, and you're supposed to remember the stuff back here. And so that's what I did, is I connected it with the stuff back here. I thought, oh yah, hey, there's a connection here. And I looked back and I connected it, right, so then when we did a review, when we did like a final test, I, I remembered everything, cause everything was connected right?
R: Right
M: Everything was linked together, and I was, you know, I made that connection, like, before I never connected with our stuff, when we were working here.
R: Right
M: But now, I could read and say, well, this is what they're going to be talking about, right? This is what, you know, I should be expecting.
R: Right.
M: Or if they talk about, say, hey, yah, they talked about this before.

APPENDIX 5
Reported Strategies at Pre- and Posttest

I. Jennifer

Pretest
R: Is there any particular method you use to write an essay? J: I've been trying to start with writing outlines. And then getting an essay. But then I always write my essay and my conclusion ends up being my introduction, and I have to write a conclusion, and I have to reread the whole thing and take half of it out to put stuff that's relevant back in. R: OK. So you're not finding that the outlining is helping you? or? J: It's helping me to stay a bit more on track to what I used to be. I still go off. R: OK. J: Maybe I need to write better outlines.
Posttest
R: OK. Um, is there any particular method you use to write an essay? J: Thousands of outlines before I actually write the essay. R: OK. J: Yah. That's about it though, I just write, I write a rough outline and a more general outline and a more specific outline then I write my essay. R: OK. Can you just describe each of those steps a little bit? J: Well, the first one is just completely rough notes. R: OK. J: Then I try to organize my rough notes into a general thing. R: And what does the general thing do? J: It's just basically, it's my different titles and my paragraphs and my subpoints I want in that. R: OK. J: Then my specific outline is almost exactly the same as my essay, except for it lacks, it's just got the general flow in it, but it lacks the sentence connections, and it might have run-on sentences and that. And then I take that and work it into an essay where my grammar and my spelling and everything are there.

II. Joanne

Pretest
R: OK, and is there any particular method you use to write a business letter? J: Find out what I'm writing about. Do a draft copy. Write all the points that I want to put into my letter. Just in point form. Then take those point form, organize what I want to say first, second, third, exactly, you know, etc., and then, you know, write a little bit about it, and then change it one or two times, depending on how good it gets, and to make it just perfect, perfect writing.
Posttest
R: OK, very good. Um, is there any particular method you use now to write a business letter? J: Um huh, I follow our, follow our sheet. Like, I mean, I know it off by hand, most of it now, but I mean, if I'm doing, I don't know, a fairly long letter, then I go right to it, but if I'm doing a shorter letter, I don't know, just follow each step, and take my time a little bit more. R: OK. J: Not so, not so rushed. R: So can you describe for me the steps that you follow? J: You mean like off the sheet? R: Yah. J: OK, so, uh, make sure I read the material. I can reread it as many times as I want, to make sure I know what I'm doing. Um, to jot down the points that I want to write in my letter. To number my points. To start my draft. When doing my draft, go over the, make sure, read, read my information again to make sure I've got all my points that I need. Um, you know, if I want add to my draft, and then, then I go to make sure that the sentences flow the right way. They've got the right commas, periods, everything. And then I do, ah, then I can reread it again, like, to make sure it checks well. Then I go for spelling and all that format, and then do the final.

III. Nancy

Pretest
R: Alright good. OK, my, this is my last question, see this is easy. Um, is there any particular method you use now to write a paper? N: Um, is there any particular method. Well, I haven't really used it yet, but I've had methods, people, like Sherry and I were talking about methods, but I haven't really used them yet, but the method I basically use, is just, whatever brainstorming's in my mind, I just start writing it down. I don't even write it in point form. And, the reason I don't do that, I should, but I feel, if I write it in point form, and I have all these point forms, and I want to use them all, and you can't really use them all in there a lot of times, and that's what I try to do, and it just frustrates me more, so I just, blank. Just, freestyle writing, just, whatever flows through my mind, and I don't know if that's, I don't think that works very well for me either, because like I said, all my thoughts go down on paper all together at once.
Posttest
R: OK, good. The next question is, is there any particular method you use to write a paper or an essay? N: Is there? Yes there is. And I have it written down. And my method is, first I start from gathering information. And it's just point form information. Whatever topics, I'll just grab books and so forth, I'll just gather all information from whatever sources I need to, on whatever topic I need to write at. From there, from gathering the information, I'll try to break my information down, into sections. In other words, topic, my introduction, my body, and my conclusion. And I'll take from all my information, I'll break down what I want to put into each section R: Um huh. N: And from there I start to write it into paragraph forms, what, from the introduction, what I took, from my notes, I'll take into my, into my first rough draft. And I'll start writing on the introduction part. And from there, I'll take whatever I wrote on my body, that I thought I was going to add into my body, and I'll start breaking that down and writing on that, I'll do a paragraph on each. And the conclusion the same thing. And then from there, I'll do a second draft, where I'll try to get that all to flow smoothly. I'll take my para, what I wrote in my paragraph, what I wrote in the body, and conclusion, and I put that all together. And then from there, I do another final draft, which is to, reorganize my writing, my sentence structures and so forth. Yah.

IV. Linda

Pretest
R: OK. Clear. Do you have any particular method you use now to solve math or statistics problems?
L: Only through practice, going through the problem so that I actually learn methods, I haven't, I have to learn the methods that are required, and, when I see a certain problem, or equation, or question, whatever, knowing, being able to draw on that knowledge. But if I don't have the knowledge, then, it's just blank. It's just a blank.
R: Blank.
L: And I find it, I perhaps, panic and don't spend enough time think, trying to think through.
R: OK. So when you know, when you know a method you're OK, you can go through it.
L: Yah, I can do it straight off.
R: But when you don't know the method straight off, you don't feel like you have a way that you, a systematic way of attacking it.
L: Yah, I mean I look at it and try different methods, but if I can't do it straight off, if I don't recognize it and can't do it straight off, then I find it quite hard, even if I do try different things, or try to apply different methods, I can't get round it. I find it quite difficult to solve.
Posttest
R: Alrighty, and is there any particular method you use, first to increase your knowledge, your conceptual knowledge, and also, but also to solve problems, those two things?... So what method do you use to make sure you understand the material?
L: Um, going through the concepts, what notes I have, or go through the books, try to build it up in that respect. And then practicing questions really is a good help to test my understanding, and then being able to go back and work out, you know, go back to the notes, to reinforce what I don't understand, to try to solve it.
R: OK. Is there any particular method you use when you're going through your notes or your book?
L: Um, now, to pinpoint on the important points, to understand exactly what, what the concept is, whether it's within, usually with the equations, to understand what it is happening within that equation, and what they're doing with it, how the numbers are being manipulated. Um, so, what you need to achieve, and then linking that up with, or linking it back with other things that I may have learned. And, you know, so it's gradually building up conceptual knowledge, is a major, major factor there.
R: OK, great. And how about when you then go to approach a problem, what method, do you have any particular method you use for solving problems?
L: Reading the question, really carefully. And then write it out in terms so that I, sort of brief terms that I understand, to just clarify that I have understood what it's, the question's asking. Because I tend to miss things, or misinterpret it if I just read it, I need to write it out again. And then, go back and try and solve it from my understanding of the question, just work through.

V. Kathy

Pretest
K: OK, the study skills that I was taught, and I was trying to follow them. Is what I usually do is go to the end of the chapter if there is a summary, and go through a summary to, you know, to introduce me to what I'm going to be, and it gives you a rough, you know, idea of what's going on. Also, then I, try to glance through the book , to get over any anticipation, or, you know curiosity is more like the word, uh, and go through things to familiarize me and look at the headings, and stuff like that. Then I go back and I try to read each part, how a chapter is divided up. Sometimes if they have a study skill book, I look at the study skill book more than the summary itself, because, it, unless, you know, I decide which is better. And, lately, I've been, I try to either as I read, highlight it, things that I think I should remember, or I try to write down things that I can't understand. But sometimes I find myself caught, and I can't get past, and I'm having a hard time letting it go to go on. Because, I think I feel a bit, I'm not going to understand the rest if I don't get that. Did I say I write things down in pencil on the side, usually, if I can interpret it. Because, sometimes I, like, one big paragraph today when I was reading, and last night, it took me a long time reading it over and over and over, it took about an hour, to understand it. But I still didn't understand this one word. But the first part of it I did understand. So, you know, it was just sort of, it's not attribution, it was, (pause) it takes me a few minutes, um it wasn't attribution (pause), oh I can't even pull it out. (pause-looking through book]. See I can't remember what attribution is.
R: Well, that's OK. Just for, give me the broad, instead of the–
K: OK. OK. what I, how I do is I, you know I highlight it. And then um, you know look, I guess attribution I think, um, I've completely forgotten what I've read.
R: OK. So, um the strat- so you've mentioned a lot of strategies that you currently use ... How helpful do you find those strategies now?
K: Um. I don't know, um. (pause). I think what they, you know, um (pause) They're helpful in the way is I know where to look, like the highlighting [um huh]. What are the important parts of the sentence, you know the [right] meat of the sentence. But uh, in the writing down, it's sort of like my trying to interpret it in my words. You know.
R: Is that helpful?
K: Ah, yah, I like to interpret it in my own language because then I can maybe, I can see it better. OK, so I think, I guess, in a way, I don't remember what it was about, uh, it's helpful.
Posttest
K: Now there is. OK. When I approach a reading task, I now use, well, try to use time management, and divide my task into chunks, rather than a whole chunk. Then I use my, the strategy I develop, developed. First, to understand what my goals, right now I'm rehearsing my goals continually, just so they're very strongly set in me. And then I use my strategy in a flexible way, so that I can accom- retrieve the main idea. OK?
R: OK.
K: And, do you want to know specifically? Like, in the strategy or?
R: Yah, sure. Yah, what kind of steps do you go through?
K: OK, I, I rehearse my, um, rule of reading. And that is, reminding myself what the goal, you know, the goal is in my task, and that is to retrieve the main idea. And to use my strategy maybe in a flexible manner.
R: OK.
K: That, and accomplish my task. Then, when I, open say a chapter, I use that strategy to help me find the format, and then I, um, divide things into chunks, and then tackle each chunk, one at a time, using the strategy, a strategy that I've developed for my main strategy, to retrieve the main idea. And once I've tackled each chunk, I link it.
R: OK. Good.
K: OK, but once I've, when I'm doing the chunk, I ask myself what the main idea is. Then I repeat it down, so that it's done three times, so it's rehearsed well. And then, then the linkage.

VI. Mike

Pretest
R: So in those, in the time that you did well at doing that, what factors were responsible for your doing well? M: Um, it would be, repeating it over and over, and just doing all the homework, and looking over it, over again. That's what I do, just repeat it, read it, repeat it, and read it again. ... R: That's fine. OK. And is there any particular method you use now for reading and studying from textbooks? M: No, not really. Not really. R: So, how would you approach it, if I gave you, like, if I gave you, here read chapter 1, what M: I would read it, and, maybe do a few notes, what I think would be, would be important. And that's where I have difficulty, is where, what, what I know is important, and what's not important, right? R: OK. M: So, I think that's what I have problems with too. ... R: Excellent, OK. So, but right now you might make a few notes, but you're not sure if they M: If they're the right notes yah, to be pulling out right now. R: OK. M: But that's what I'd be doing, yah. R: OK, and then, and then you would just look, what would you do after that to study? That would be it? Or would you? M: That would be it. R: OK. M: There you go, that's the way I study.
Posttest
M: Well, I um, I talked about it more, with more people I guess. I did talk, I did do some more studying with other people. And that really did help a lot too. ... M: And the terms and stuff, I, I, I tried to remember the terms also by visualizing it, and then, you know, writing it out too. Cause there were some terms that, I, I didn't get, like the formulas and stuff. .... I was actually really surprised I was able to remember those formulas. ... M: Yah, like I mean, like for my math, I didn't make any connections for a while, right? I was just working the way it was going. I didn't like put, in math, everything is connected, right? It's a building block, and you're supposed to remember the stuff back here. And so that's what I did, is I connected it with the stuff back here. I thought, oh yah, hey, there's a connection here. And I looked back and I connected it, right, so then when we did a review, when we did like a final test, I, I remembered everything, cause everything was connected right?... Everything was linked together, and I was, you know, I made that connection, like, before I never connected with our stuff, when we were working here. R: Right. M: But now, I could read and say, well, this is what they're going to be talking about, right? This is what, you know, I should be expecting. ... R: So is there any particular method you use to read and study from textbooks, now. M: I guess I just said it right there, in a way. I, I read it from what it's trying to say. And, and I say, OK, well this is what they're going to be talking about. For the first little part they're going to be saying, OK, well they're going to be saying this, and talking about the cortex, right? and the different, the different, different systems of the cortex, right? So, OK, well that's what I'm expecting. So they're going to go in further detail on that, right? R: Right, OK. And then, what, I know you described some of it before. M: And then I would like, I would say, OK, well, yah, this is what they are talking about, I would make a connection with everything, right? I'd say, OK, well this is the connection and everything.

APPENDIX 6
Observed Strategies at Pre- and Posttest

I. Jennifer

Pretest

On-line assessment of strategy use while writing an essay:
She had to give an oral presentation in an economics course, and had done all the research. She started writing her draft of her presentation as she normally would (from field notes):

"Current: has rough notes, translates points almost directly to sentences in her essay.
Plan: rough notes
Writing: pulled in sentences straight from the notes
Revising: Mom"

Posttest

(Final Strategy)

1. Do research for essay
2. Planning
   a. make list of definitions and rough notes first
   b. find 2-3 main points- how notes interconnect
   c. go through the notes and fit them into sections
   d. number points in notes to help figure out what section they belong in
   e. make sure that you have good titles that connect back to the topic
   f. talk to your stuffed animals as if you were explaining it to someone
3. Make plans
   a. make a preliminary plan with an overview of the theme and main points/links and subpoints/ links
   b. make a detailed plan with sentences as points and links between points built in
      - make points in order
      - tie back to main points
      - link sentences to create a flow
      - build definitions into the sense of the text
4. Translate plans into an essay with paragraphs and formatting
5. Revise the essay
   a. reread the essay, make sure you are making your points clearly
   b. make sure the sentences flow
   c. check grammar
   d. check spelling and punctuation

II. Joanne

Pretest
On-line assessment of strategy use while writing a letter: 1. Read through, summarized generally the problem 2. Picked out what she needed to write about in point form 3. Took wording from book- imported to letter 4. Revisions- kept general form and did within sentence revisions. 5. Used her spell checker 6. Would have someone read it for input Noted problem areas in field notes: "-Needs to consider audience more- asking if someone's book 'is better' -Link between ideas? -Choice of words in expressing ideas -Specificity of points and questions" Original Strategy (outlined verbally) 1. Find out what you're writing about 2. Make out points of the specific things you want to include 3. Organize the points so they make sense 4. Write the letter- rough draft 5. Go back and read each sentence and paragraph. Change it until it makes sense. 6. Spell check, check format, check style.
Posttest
Final Strategy 1. Find out what you're writing about • Read slow, listen to each word • If you don't understand what you are going to write about, reread it again and again. 2. Make out points of specific things you want to include • Be more specific and to the point • Read around for other points that go together • Consider what you should and shouldn't include- what does the reader need to know? • Consider the audience's point of view 3. Organize the points so they make sense • Look again for points that go together • Depends on the situation of the letter • Think about what the audience would want to hear (not negative) • Number your points 4. Write the letter- a rough draft • Try to be less complex- more like how you talk- more direct • Keep in mind what you're writing about- reread and keep in mind the whole picture 5. Go back and read each sentence and paragraph. Change it until it makes sense. • Reread the original materials (e.g. correspondence or cases) • Go back to the points all the time, to see if you missed at the time • Keep rereading word by word- go slower • Ask yourself, does it make sense, not just to you, but to someone else 6. Spell check, check format, check style • Have someone proof read if necessary • Look back on references for examples (in books or correspondence) • Commas: use a 'pause'- read sentence and where you pause, you usually need a comma • Look for sentences that can be broken up • Grammar- check back to Chapter 21 for grammar and examples

III. Nancy

Pretest

On-line assessment of strategy use while writing an essay:
Her task was to write an essay based on an observation assignment. She was to answer specific questions after observing young children in a daycare environment.

1. Started by rereading the assignment.
2. Has the sense she should point form (she says), but isn't sure what to do.
3. Says she would introduce the context (where she did the observation) and then describe what happened as a narrative.
4. Had her write the first couple of paragraphs as she normally would if I weren't here. She translated her notes directly into a description of what happened. No intervening plan. Didn't organize her essay to respond to the questions in the assignment.
5. Revising- has a pretty good sense that she should combine sentences to make it less repetitive, and spice up the wording to make it sound more active. But she doesn't have a theme to center it around outside of a description- why is she describing it? What point is she trying to make?

Note: work on how to think about possible ideas and jot them down in advance and working through drafts.

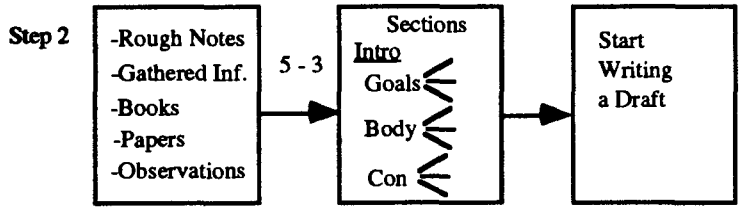
Posttest

(Final Strategy)

A. Understanding the base / or format of the assignment
   1) Read the format and analize each sentence
   2) Break each sentence down, until it makes clear sense
   3) Once you have a clear understanding of the sentence. Underline or make note of the important piece.
   4) Go on to the next sentence and repeat #3 until the whole assignment is understood.

B. Taking Notes
   1) Once you understand the base of the assignment
   2) Next to find information on the assignment, and make them into notes (brainstorm)
   3) Take the notes on the base of the assignment and think of a way your going to organize this on paper.

   Example #3. Rewrite the notes in sections using only the notes that are going to help you answer the question for the assignment.



   4) Work on the final copy using step-3 and Notes from step 2.

IV. Linda

Pretest
Review of her first test for her statistics class, which she did independently (score: 1/12). From field notes (10/8/92): "Her sense of the problem: tied in with background knowledge about the problem. Thinks of "strategies" as specific approaches to specific problem types; Not general strategies for attacking math problems or dealing with problems that she can solve right off. Says she tries a few methods when she doesn't know about a problem, but then is really stumped and doesn't know what to do".
Posttest
Strategy Sheet Part I: Building Conceptual Knowledge 1. Read text before class Write up notes from class and text 2. Go through notes- trying to really understand conceptually what is going on - pull out conceptual points initially - relate it to the examples - link it back to previous work 3. Go through the text to add in other bits 4. Try to problem solve, once you think you understand. If stuck, target questions and go back to the notes Part II: Problem Solving 1. Start from the basics- use exactly what is given 2. Draw out or reword question so understand what is being asked 3. Use information to solve question, keeping it simple 4. Recheck the answer to ensure the interpretation is correct and the whole question is answered

V. Kathy

Pretest
On-line assessment of strategy use while reading a passage: *Within sentences:* circles new terms and writes definitions in the margin. Rewords sentences phrase by phrase to get meaning. *Across sentences:* underlines key phrases. Writes summary notes/comments re: relationships in margins. Refers frequently to other sources (dictionaries, other books) to clarify concepts. "She tries early to link new information with other texts, before she really has a sense of what she is trying to read. This colors her interpretation of the new material. She's almost confusing herself by bouncing back and forth between material- not getting the flow within a single text... even when she does understand a sentence, she has trouble summarizing/ pulling out the gist afterward."
Posttest
Rule of Reading Your Strategic Approach Is In A Problem Solving Mode! 1. To Subtrack Main Idea + Focus In Reading Task 2. To Use Strategy To Aid In Focusing On And Subtracting Main Idea Behind Reading Task. 3. To Remind Myself That The Strategy CAN BE Flexible to Meet The Needs of Focusing and Subtracting The Main Idea. 4. To Develop New Flexible Outlines If Necessary To Aid In Focusing And Subtracting Main Idea (Review Format) 5. If Comprehension Breaks down, Remember You Now May Have Problem -> Go Back To Your Strategies To Solve Problem, Then Proceed. --- (Main Strategy) WHAT ROLE DO THESE SUBSECTIONS PLAY? GOAL -> To subtrack Main IDEA 1. Read Title • Obtain clue about reading task 2. Review Format of Reading Material • Divide into Chunks • Remember what each chunks purpose is, i.e.. intro 3. Read Title (if any) of Chunks to obtain clue about Reading Task 4. When Reading FOCUS only on CHUNK 5. When you have Finished Reading Chunk- Ask yourself what the MAIN IDEA Is. (Interpret in your own words and then write it down) 6. After Reading whole Task try to LINK each CHUNK 7. If CHUNKS Become to Difficult to Focus On Divide CHUNKS Into Sub-CHUNKS and then LINK

V. Kathy (cont'd)

Follow-Up
(Reading a New Kind of Book) Main Idea- problem condensing Whole Book Lecture- I am putting words that do not belong, repeat Exam- Do not understand how to approach examine questions? Dif kinds. What Kind of Book is it? What is the task for this book? How can your notes help? When you find out the task, clarify what that means. ie critizm, comparison -> Critisim What is the role of a critisim When you find out what this means apply this with the aid of lecture notes if it applies -> Look at Language used -> Who is the authors audience -> What is his/her arguement -> Look for info about author -> -> Do you agree/disagree what author is saying

VI. Mike

Pretest
<u>On-line assessment of strategy use while reading</u>: He was reading the introductory chapter from a Psychology text for the first time. From field notes: 1. Previews material- looks at headings, pictures, captions. Not systematic- just to get an idea. -> confirms predictions from pictures by looking a bit at the text 2. Starts reading. Skims parts- skips over bits- rather than working through systematically. Skimming and getting a big picture. Doesn't think certain parts are important- would skip those. Goes back and forth a bit. 3. Very good basic understanding from reading words and sentences. But is having trouble understanding overall- flipping back and forth. He thinks he might be losing information (good reflection). 4. Says he has problems with his attention span. - Trouble with some of the words- abandons reading then. Can get it if he tries a bit. Showed that he made a prediction about what 'physiological' was, and it was confirmed in reading further. But he was hesitant to continue when he didn't know the word. - Draws a lot of inferences from quick scanning of the material. - Has considerable gaps in background knowledge. <u>Reported initial strategy to study same chapter section between meetings</u>: 1. Read book- paid attention to bolded information 2. Took notes on important or bolded points 3. Wrote notes but not sure that he always had it right 4. Tried using different colors in his notes 5. Focused on 'main ideas' rather than 'vague' information

VI. Mike (cont'd)

Posttest

(Pieces of his Final Strategy)

I. Reading chapter- written out by student
Read the section of the head title
Try making a caniction in whats being said
Try to find each section
Then somerize each section

II. Strategies developed in discussion but not written out
A. Reading Chapter
1. Focus not just on understanding paragraphs, but also on recognizing the whole structure and the links between ideas.
2. Compare/ Contrast points and see relationships
3. Understand the arguments the authors are trying to make before moving beyond it, to make inferences
4. Look for clues as to what is important (e.g., stressed words, linking ideas across sentences, signaling words).
5. Clarify unclear words that are important to comprehension
6. Use boxes and figures to aid in comprehension but not as a substitute for reading

B. Studying Text Information
1. Read once to understand main direction
2. Read again, each paragraph, making links
3. Summarize each paragraph
4. Write notes on main points
5. Rehearse main ideas in his head

C. Learning New Terms
1. Study- learn the meaning of the term
2. Pronounce the word properly (look at it carefully)
3. Visualize the term in your head
4. Write it on paper without looking (test self)
5. Check the correct spelling
6. Repeat and practice