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Effects of Metacognitive Skill Training Upon Academic Performance In Accounting

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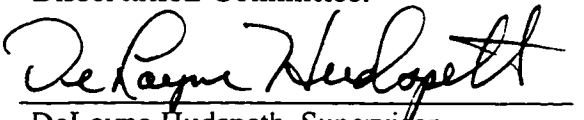

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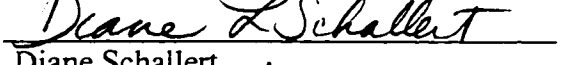

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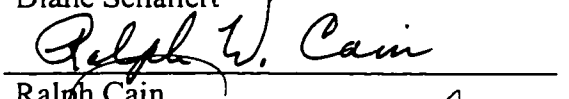

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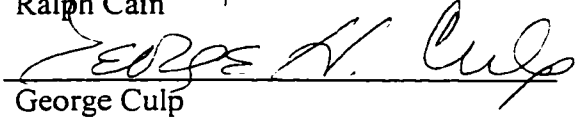

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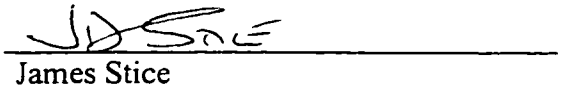

James Stice

Effects of Metacognitive Skill Training Upon Academic Performance In Accounting

by

David Michael Harris, B.B.A, M.S. in Accty.

Dissertation

Presented to the Faculty of the Graduate School of

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Effects of Metacognitive Skill Training Upon Academic Performance In Accounting

Publication No._____

David Michael Harris, Ph.D.

The University of Texas at Austin, 1998

Supervisor: DeLayne Hudspeth

Accounting practitioners have strongly criticized accounting educators for teaching students facts but not developing critical thinking skills. Metacognitive skills are a component of critical thinking skills. The purpose of this study was to test the effect upon academic performance of computer-based instruction modified to increase metacognitive skills in accounting. The sample contained 58 students in four intact financial accounting classes at a large southwestern community college. Two instructors each taught two of the four classes. An existing financial accounting software program was modified to include suitable learning strategies and prompts to increase learners' metacognitive skills. The Multiple Learning Strategies Questionnaire (MSLQ) was used to measure changes in metacognitive skills. The treatment group received the modified software and the control group received the original software. Three research questions were investigated: (1) Would students who use software modified to include metacognitive skill training significantly increase metacognitive skill levels compared to

students who do not use modified software; (2) Would students who use software modified to increase metacognitive skill levels achieve significantly higher performance on an accounting test than students who do not use modified software; and (3) Will the increase in metacognitive skills be positively correlated with the increase in academic performance among students using software modified to include metacognitive skill training? The statistical method used was analysis of covariance. Although none of the research questions were answered affirmatively, some significant differences were found. Control group scores were significantly higher for the metacognitive skill of effort regulation and the motivation scale of control of learning beliefs. Treatment group scores were significantly higher for seeking help from peers. Recommendations for future research are provided.

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Chapter 1: Introduction

STATEMENT OF THE PROBLEM

The Narrow Focus of Accounting Education

Dissatisfaction with accounting education has existed for the last one hundred years (Langenderfer, 1987). When accounting practitioners in America began to support the teaching of accounting in universities a century ago, university administrators considered arts and sciences to be the only proper subjects of a university course of study (Previts and Merino, 1979, p. 153). To overcome this prejudice, accountants "either financed directly or underwrote the first university business schools" (Previts and Merino, 1979, p. 155). Yet even in the beginning accounting practitioners were dissatisfied with the narrow focus of accounting education.

> After securing acceptance for accounting curricula in universities, accountants began to advocate an expansion of university education to realize the goals of broader, more conceptual programs. Most practitioners considered mastery of the technical procedures of auditing and accounting to be most effectively learned through practical experience; education's role was to develop analytical ability. Accounting, they believed, required a wide range of knowledge and minds trained to think analytically and constructively. They supported a broad program emphasizing theory and philosophy and were disappointed when the evidence accumulated that accounting educators tended to emphasize the narrow, technical training.... It was the university accounting educators who moved from the theoretical approach and turned to procedural orientation. The...accountants...believed in the concept of a broad, general and liberal education. The accounting educators...were influenced by John Dewey and his followers, who stressed practicality and relevance. Unfortunately, 'progressive' education became interpreted to mean a kind of vocationalism with little sympathy or use for so-called

> 'classical' subjects. (Practitioners were) deeply disappointed with the trends in the university business schools they had done so much to foster... (Previts and Merino, 1979, p. 154-155)

The narrow emphasis of accounting education remains unchanged today despite ongoing dissatisfaction among practitioners (Langenderfer, 1987). Further, "the magnitude and complexity of the required 'common body of knowledge' expanded at an exponential rate" (Nelson, 1995, p. 63). Changes in federal government regulation, changes in regulation of the profession by the profession, and changes in the complexity of business environments have been contributing factors to the growth of accounting knowledge. Each year Congress and the Internal Revenue Service add more detail to an already complex income tax code. The Securities and Exchange Commission continues to add to the regulations and requirements for reporting financial information to investors in publicly traded companies. The Financial Accounting Standards Board is the independent, professional organization charged with setting general financial reporting rules, and as of October, 1997, has issued 127 detailed, specific pronouncements on accounting rules. No end is in sight. Nelson (1995) states that the explosion in technical knowledge:

> ...compounded a classic three-way educational dilemma: breadth of education vs. depth of learning vs. technical coverage...Given a fixed number of credit hours available, educators in all fields have always struggled to find a balance between these three dimensions. In actual practice, accounting academicians have historically favored technical coverage. They have felt an obligation to teach every technical aspect of accounting procedure....this further reduced the liberal education component in accounting programs, which practitioners had felt was too sparse from the beginning. Thus, the breadth of education was further narrowed. Depth was sacrificed, as well" (p. 63-64).

The result has been that courses came to be used as a "funnel to pour information into a student" (Nelson, 1989, p. 47), and "the quantity of technical material covered has grown so voluminous that the depth of understanding regarding the issues and theories underlying memorized accounting rules has become very shallow" (Nelson, 1995, p. 65).

Practitioners Identify Deficiencies in Accounting Education

In 1986, the American Accounting Association formed the Committee on the Future Structure, Content, and Scope of Accounting Education, (popularly known as the Bedford Committee), to study accounting practice and accounting education between 1925 and 1985. The committee reported that accounting education changed very little during the period despite significant expansion in the scope of accounting practice and accounting services (Bedford and Shenkir, 1987, p. 84). The Bedford Committee found that:

> Despite widespread complaints that accounting graduates do not know how to communicate, do not reason logically, are deficient in interpersonal skills, and cannot think creatively and responsibly, university accounting education has persisted in teaching the content of textbooks rather than developing students' capabilities (Bedford and Shenkir, 1987, p. 86).

Ten years ago, Langenderfer wrote "accounting education hasn't fulfilled all the expectations of the leaders of the profession of 100 years ago or of its leaders today" (1987, p. 304). In 1989, the largest eight national accounting firms jointly issued a white paper, which took the position that "Passing the CPA examination should not be the goal of accounting education. The focus should be on developing analytical and conceptual thinking – versus memorizing rapidly expanding professional standards" (Perspectives, p. 8). The large accounting

firms have a large stake in the education of accountants. Each year, these firms hire 10,000 graduates and donate more than $20 million to higher education, in addition to operating internal education divisions for continuing the education of all employees (Wyer, 1993). The position of the largest accounting firms on education today echoes the original intent of college education for accountants, described eighty years ago in terms of what accounting education should not be:

> If by education we mean the cramming of a pupil's mind with facts or rules, without any real conception of their meaning or of the relations in which they stand to each other, it is perfectly safe to say that it is a waste of time. This kind of education fits a man for a certain groove, in which he moves in a routine way, a mere piece of mechanical machinery, incapable of independent thought or action. If confronted with a new condition, to which his rules do not apply, he is helpless, and is liable to make mistakes that are disastrous, because his action is based on insufficient knowledge of the foundation principles...(Walton, 1917, p. 281).

Actions to Promote Change in Accounting Education

The level of dissatisfaction with accounting education has at last reached an intensity high enough among practitioners to generate action among practitioners and educators alike. For example, the American Accounting Association created the Accounting Education Change Commission, intended to be a vehicle to foster and fund innovation in accounting education. The American Assembly of Collegiate Schools of Business recently toughened accreditation requirements for member schools. An 83% majority of the membership of the American Institute of Certified Public Accountants recently passed a resolution that would require applicants for membership after the year 2000 to have at least 150 hours of college credit. Many states have extended the thrust of the

American Institute of Certified Public Accountants membership proposal, and either have written into law or are moving to write into law a requirement that applicants for new CPA licenses have a minimum of 150 semester hours of college credit.

Focus on Learning Strategies

The change to require more semester hours of education does not by itself answer the criticisms of accounting education described above. The large international accounting firms called for change, certainly, but also expressed concern that simply adding more coursework might only worsen the existing situation (Perspectives, 1989, p. 13). Instead, the accounting firms suggest a focus on a "learning machine" model, an instructional mode emphasizing expert learning strategies (Perspectives, 1989, p. 26). The Accounting Education Change Commission echoes the suggestion of the large accounting firms with a call from the current mode of instruction to a "learning to learn" approach (Accounting Education Change Commission, 1990, p. 310). Mayer-Sommer (1990, p. 139) states "To prepare students for a lifetime of learning, we will have to teach them to learn how to learn. We can do this by explicitly teaching expert learning- and problem-solving strategies."

Cognitive psychology research in cognition and metacognition may offer solutions for the problems with accounting education identified by accounting practitioners. One remedy that directly addresses concerns of accounting practitioners is improvement in critical thinking skills. Kurfiss defines critical thinking as "an investigation whose purpose is to explore a situation,

phenomenon, question, or problem to arrive at a hypothesis or conclusion about it that integrates all available information and that can therefore be convincingly justified" (1988, p. 2). An ability to employ critical thinking, as defined by Kurfiss, seems exactly what accounting practitioners claim is needed in accounting but is not gained by accounting students from current accounting education. Kurfiss (1989) described the process of critical thinking as two steps that hold true for all disciplines. The first step is the discovery of concepts and the second step is the justification of concepts. "In the discovery phase, we examine in search of patterns and formulate interpretations or hypotheses about what the evidence means. In the justification phase, we set forth our conclusions, reasoning, and evidence in an argument" (Kurfiss, 1989, p. 42).

According to Ennis (1987), development of critical thinking skills requires development of three component areas: (a) a critical thinking disposition, (b) use of higher-order thinking skills such as those in Bloom's taxonomy (1956), and (c) strategic problem solving abilities.

However, Ennis (1987) recommends that classroom educators develop critical thinking by first individually developing the basic elements of the critical thinking process. Huffman, Vernoy, Williams, and Vernoy (1991, p. xx-xxi) developed a framework list of basic elements of the critical thinking process. The framework groups the components of critical thinking into three main areas which correspond to the three areas identified by Ennis (1987). One main area in the framework list of Huffman, et al. (1991, p. xx-xxi) is affective components of critical thinking. Affective components are emotional factors that affect the

learner's ability to employ critical thinking. Affective components include valuing truth above self-interest, accepting change, empathizing, welcoming divergent views, tolerating ambiguity, and recognizing personal biases.

Another main group of critical thinking elements includes cognitive components. Cognitive components are the thought processes that occur during critical thinking. Cognitive components include independent thinking, accurate problem definition, analysis of data for value and content, use of a variety of thinking processes in problem solving, synthesis, resistance of over-generalization, and employment of metacognition.

The third main area is behavioral components of critical thinking. Behavioral components are those learner behaviors necessary for critical thinking. Behavioral components include delaying judgment until adequate data are available, employing precise terms, gathering data, distinguishing fact from opinion, encouraging critical dialogue, listening actively, modifying judgments in light of new information, and applying knowledge to new situations.

This study is concerned with metacognition. Metacognition is a critical thinking element in the second main area of the framework list of Huffman, et. al. (1991, p. xx-xxi). In this study metacognition is defined as both awareness and control of cognition. The theory of metacognition and the definition of metacognition will be expanded upon in Chapter 2.

PURPOSE OF THE STUDY

The purpose of this study was to determine whether accounting instructional software could be modified to produce an increase in metacognition,

an element of thinking skills, with a corresponding increase in accounting academic performance. Changes in metacognition were measured by changes in responses on the Motivated Strategies for Learning Questionnaire (Pintrich, Smith, Garcia, & McKeachie, 1991). Academic performance was measured by scores on a standardized examination.

Specifically, this study investigated the following research questions:

1. Will students who use software modified to include metacognitive skill training significantly increase metacognitive skill levels compared to students who do not use modified software?

2. Will students who use software modified to increase metacognitive skill levels achieve significantly higher performance on an accounting test than students who do not use modified software?

3. Will the increase in metacognitive skill levels be positively correlated with the increase in academic performance among students using software modified to include metacognitive skill training?

Chapter Two: Review of Literature

The research variables of interest in this study were metacognitive skills and academic performance. Metacognitive skills refer to a learner's awareness of cognition and to the learner's ability to regulate cognition to achieve a learning goal. Academic performance is defined as the student's score on an achievement test designed to measure application of basic accounting principles.

SIGNIFICANT FACTORS IN STUDENT LEARNING

In a meta-analysis of significant factors in student learning, Wang, Haertel, and Walberg (1993) analyzed 179 handbook chapters and reviews, compiled 91 research syntheses, and surveyed 61 educational researchers to create a knowledge base of 11,000 statistical findings. Wang, et al. (1993) identified 28 categories of variables that influence student learning. The 28 categories were grouped into six broad types of influences. The most significant influence was student aptitude. The second most significant influences was classroom instruction and climate.

The student aptitude grouping contained the variable of student metacognitive processes. Wang, et al. (1993) found that students' metacognitive processes had the most effect on student learning. The classroom instruction and climate grouping included such variables as classroom management, student and teacher interactions, teacher management of instructional time, classroom climate, and classroom instruction. The classroom management variable included elements of teacher instructional style such as "group alerting, learner

accountability, smooth transitions, and teacher 'with-it-ness" (Wang, et al., 1993, p. 79). The variable of student and teacher social interaction influenced student self-esteem and sense of membership in the class and school. The classroom climate variable referred to elements of classroom life such as teacher and student cooperation, common interests and values among students and teachers, pursuit of common goals, and clear academic focus. Also included in the classroom climate variable were teacher-specific elements such as well-organized and well-planned lessons, explicit learning objectives, appropriate task difficulty and instructional pace. The classroom instruction variable measured the techniques used by teachers to ensure student understanding of instructional goals and content.

Wang, et al. (1993) demonstrated that classroom instruction and climate variables could have a significant effect on student learning. However, classroom instruction and climate were not variables of interest in this study. The potential nuisance variance in classroom instruction and climate were controlled with analysis of covariance.

PREVIOUS RESEARCH IN METACOGNITION

Metacognitive Knowledge

Flavell (1976) originally proposed the construct of metacognition. Metacognition was described as "knowledge and cognition about cognitive phenomena" and "the monitoring of memory, comprehension and other cognitive enterprises" (Flavell, 1979, p. 3). Flavell (1976, 1979, 1987) considered metacognition to be composed of metacognitive knowledge and metacognitive experiences. Metacognitive knowledge is an individual's acquired knowledge of

how he or she thinks. Flavell describes three types of metacognitive knowledge: knowledge of person, knowledge of task, and knowledge of strategy. Knowledge of person is an individual's own knowledge and beliefs about cognitive strengths and weaknesses in himself and others. Knowledge of task is an individual's knowledge of the requirements of the learning task before him. Knowledge of strategy is an individual's knowledge of cognitive strategies to employ to accomplish the learning task before him. All three types of metacognitive knowledge interact with one another and affect one another (Flavell, 1987).

Metacognitive knowledge is supplemented by metacognitive experience. Metacognitive experience is "any conscious cognitive or affective experiences that accompany and pertain to any intellectual enterprise" (Flavell, 1979, p. 906). More simply, metacognitive experiences couple awareness of cognition with realization of cognitive success or failure, whether actual or anticipated (Garner, 1987).

Metacognitive Regulation

Initially, researchers attributed learning success due to effective metacognition primarily to the learner's metacognitive knowledge of person, task, and strategy (Flavell, 1976, 1979, 1987; Flavell and Wellman, 1977; and Garner, 1987, 1990). Subsequently, Baker and Brown (1984), Billingsley and Wildman (1990), Borkowski, et al., (1987, 1988, 1989, 1990), Brown (1987), Brown and Palincsar (1982), and Pressley and Ghatala (1990) proposed that learning success due to metacognitive effectiveness is the result of regulation or control of metacognitive activity instead of metacognitive knowledge. The latter group of

researchers describe metacognition as knowledge of cognition combined with regulation of cognition. Knowledge of cognition describes learner self-awareness of cognitive activity together with learner awareness of available cognitive strategies, or in other words, learner awareness of what the learner knows, how the learner thinks, and why and when the learner should apply knowledge and strategies. Regulation of cognition describes the selection, application, and evaluation of cognitive strategies by the learner to successfully complete a learning task.

Brown (1980, 1987) asserts that differences in the efficiency of learners comes from differences in regulation of cognition, and further asserts that regulation of cognition can be taught. The first assertion, that regulation of cognition influences learning performance, is supported by the research of Henderson (1986), Wang and Peverly (1986), Zimmerman (1990), Zimmerman and Martinez-Pons (1986). In particular, Zimmerman and Martinez-Pons (1986) demonstrated a strong relationship between metacognitive skill use and higher academic performance. In subsequent research, Zimmerman and Martinez-Pons (1988) demonstrated that self-regulated learning strategies (metacognitive regulation) contributed to academic achievement apart from general ability. Fisher and Mandl (1984) examined the correlations of metacognitive regulation, comprehension, and recall performance in a study of reading comprehension among twenty-four college students, and found significant correlations between seven of ten tested dimensions of metacognitive regulation. Otero, Campanario, and Hopkins (1992) found significant positive correlations between metacognitive

comprehension monitoring ability (regulation) and academic achievement in two hundred eighteen high school students.

The second assertion of Brown (1980, 1987), that cognitive regulation can be taught to learners without skills in cognitive regulation with a resulting increase in the learners' academic performance, is supported by Brown and Palincsar (1982), Brown, Palincsar, and Armbruster (1984), Derry and Murphy (1986), Paris and Oka (1986), Redding (1990), and Wong and Jones (1982). Redding (1990) offers specific examples below of metacognitive regulation skills which can be taught:

1. Construction of mental models to support task performance
2. Refinement of problem solving strategies and heuristics
3. Verbal or visual rehearsal
4. Self-monitoring of attention allocation
5. Development of an awareness of problem areas

Redding (1990) cautions that although learners can be explicitly taught self-regulation of metacognition, learners often do not remember to apply metacognitive strategies and the strategies themselves consume mental resources. Scardamalia and Bereiter (1985) developed techniques to help learners develop self-regulation skills with minimum interference with mental processing. Scardamalia and Bereiter (1985) first identified the differences in components of metacognitive regulation between experts and novices accomplishing a task and then explicitly taught the novices the specific components of metacognitive regulation used by the experts.

The training methods used to teach metacognitive regulation have been of three types: blind, informed, and self-control (Brown, Campione, & Day, 1981). Learners in the blind type of training method are given little supporting context for use of the strategies taught and no information about the importance nor the purpose of the activities the learners are asked to perform. The researcher is not blind either to the importance or the purpose of the activities and must carefully select the activities to develop the skills required for the specific learning tasks at hand. Learners "are told what to do or led to do it by the experimenter, but they are not informed why they should act this way, or that it helps performance, or that it is an activity appropriate to a particular class of situations, materials, or goals" (Brown & Palincsar, 1982, p. 5). A weakness of the blind training method is that the effects of the training decline to insignificance without the training cues, according to Ryan, Ledger, Short, and Weed (1982). Brown and Palincsar (1982) affirm that blind training cannot ensure maintenance or generalization of the strategies taught despite the initial performance benefits the strategies may have brought about.

In contrast to blind training, informed training provides the learner with an explanation of how and why to use a cognitive strategy (Brown & Palincsar, 1982; Ryan, Ledger, Short, & Weed, 1982). Groller, Kender, and Honeyman (1991) used informed training methods with forty-five eleventh graders and found a strong relationship between cognitive regulation and performance in reading comprehension. Paris, Saarnio, and Cross (1986) had similar success with informed training to promote metacognition about reading with 87 third-graders

and 84 fifth-graders. Of particular importance to this study is the finding that learners who master cognitive strategies during training are more likely to maintain the strategy than learners who do not (Brown, Day, & Jones, 1983).

The third type of method of teaching metacognitive regulation is self-control training. "Self-control training involves developing an awareness of one's mental processes as well as the tools through which mental processes can be effectively and independently invoked and monitored" (Osman & Hannafin, 1992, p. 89). Self-control training instructs learners directly in specific metacognitive regulation skills such as planning, monitoring, control, evaluation, and remediation, so that learners can self-regulate cognitive activity. Self-control training has been shown to promote self-sufficiency as well as improving learners' performance (Brown, 1982; Brown, Campione, & Day, 1981).

Though each of the foregoing metacognitive regulation training methods has merit in certain situations, Brown and Palincsar (1982) and Brown, Palincsar, and Armbruster (1984), argue that the most effective metacognitive regulation training program would combine features of two or more of the three training methods. A program combining all three methods might include skill training and strategy practice (the main feature of blind training), awareness training and instruction in strategy selection and use (the main feature of informed training), together with instruction in regulation of use of the strategy selected (the main feature of self-control training). Paris and Oka (1986), delivered a metacognitive regulation training program which combined informed and self-control training and the treatment group showed significant gains in awareness of cognition as

well as superior use of strategic skills. Nolan (1991) found that combined training methods increased comprehension significantly more than either of the individual methods applied alone.

Results are mixed as to whether metacognitive regulation training differentially benefits learners with high metacognitive knowledge versus learners with low metacognitive knowledge. Kurtz and Borkowski (1984) and Cornoldi, Gobbo, and Mazzoni (1991) found that metacognitive regulation training produced performance gains in both treatment groups and that students in the higher metacognitive knowledge treatment group had higher performance gains than students in the lower metacognitive knowledge treatment group. In contradiction, Wong and Jones (1982) and Hasselhorn and Körkel (1986) found that although all treatment groups improved performance the students with lower metacognitive knowledge received more performance benefit from metacognitive training than did students with higher metacognitive knowledge. Nonetheless, the only difference in findings is the amount of benefit received by one group relative to the other because both groups of learners received benefit from metacognitive regulation training. Despite the contradiction as to whether high or low metacognitive knowledge students benefit more or less from metacognitive training, the above studies of Kurtz and Borkowski (1984), Cornoldi, Gobbo, and Mazzoni (1991), Wong and Jones (1982), and Hasselhorn and Körkel (1986) all found that metacognitive training resulted in performance gains for the subjects in the studies.

Transfer of Skills

"Transfer refers to the application of a trained strategy to dissimilar learning tasks, problems, or circumstances" (Osman & Hannafin, 1992, p. 90). The application of a strategy to a new situation that is similar to the training situation is described as near transfer, while the application of a strategy to a new situation that is not similar to the training situation is described as far transfer (Clark, 1984). Previous research has suggested that "an emphasis on metacognition during training can result in significant improvements in problem solving for the task, as well as in transfer of skills across tasks" (Redding, 1990, p. 27). Singer and Suwanthanda (1986) also found metacognitive skill training to be positively correlated with transfer.

To promote skill transfer across tasks, it is important that strategy training should include training in use of strategies in practical situations by "clarifying the learning situation, constructing a strategy, carrying-out the strategy, and checking the results" (Derry, 1989, p. 6). Informed and self-control training methods appear "to make the portability of the strategies more apparent and less nested within given lesson content" (Osman & Hannafin, 1992, p. 91). In the instance of self-control training, Brown and Palincsar (1982) found that "Direct instruction of self-control is particularly important in the context of transfer" (p. 6).

Effective Cognitive Strategies in Instructional Design

West, Farmer, and Wolff (1991) assert that "With both print and electronic media, students can be intellectually inactive, merely exposed. With

many of the cognitive strategies turned to techniques and designed into instruction, however, students become intellectually active and are much more likely to construct those mental representations which we think of as knowledge" (p. 27). West, et al. (1991) identified nine cognitive strategies appropriate for use in instructional design. The nine strategies were chunking, Frames type one, Frames type two, concept mapping, advance organizers, metaphors – analogy, rehearsal, and imagery. West, et al. (1991) presented a decision matrix to help select a particular strategy based upon the instructional environment and characteristics. Strategies were characterized according to how well each strategy might meet the following instructional design criteria:

1. Concrete or abstract lesson content
2. Degree of structure in the lesson content
3. Knowledge type – declarative, conditional, or procedural
4. Potential for long-term recall
5. Data tonnage capacity
6. Power or effectiveness in achieving instructional goals
7. Appropriateness of combination with other strategies

Several cognitive strategies were selected to be used in the instructional design tested in this study. The primary cognitive strategy used in the instructional design was a frame type two. West, et al. (1991) state that a frame type two is both a spatial strategy and a bridging strategy, and may be used with either concrete or abstract lesson content that is highly structured and operates according to specific rules. West, et al (1991) also state that a frame type two

frame works with either declarative, conditional, or procedural knowledge, has very high long-term recall potential, can convey very much information, and is very effective in achieving instructional goals.

A concept map is another cognitive strategy used in the instructional design in this study. West, et al (1991) state that a concept map is a spatial cognitive strategy that may be used with either concrete or abstract lesson content and requires only medium structure in lesson content. West, et al. (1991) also indicate that a concept map has fair long-term recall potential, can convey much information, and is effective in achieving instructional goals.

Imagery is another cognitive strategy used in the instructional design in this study. According to West, et al. (1991) an image is a general purpose strategy appropriate for concrete lesson content, requires little content structure, and may be used with either declarative, procedural, or conditional knowledge. West, et al. (1991) indicate that imagery has fair long-term recall potential, can convey much information, and is effective in achieving instructional goals. The instructional power of an image is increased if the image is bizarre or vivid. A vivid image would be an image that has "clarity, distinctness, and strength" (West, et al., 1991, p. 181). A bizarre image is one that is "weird, unusual, incongruous" (West, et al., 1991, p. 182).

Impediments to Teaching Learning Strategies to Improve Learning

The research previously discussed offers several examples of successful instruction in learning strategy use for a corresponding increase in learning performance. However, sometimes learners fail to use learning strategies even

though learners are aware of learning strategies. "Cognitive and metacognitive strategies enhance learning. . . . Yet, just as subway travelers who may stare at an older pregnant woman with a broken leg know that they should offer her their seats but do not and dieters at the dinner table can count calories but overeat, learners involved in a task know they should employ strategies but do not." (Garner, 1990, p. 517-518). Garner (1990) emphasizes that awareness of learning strategies is insufficient without active use of learning strategies. The learner must take action to use a learning strategy in order to gain benefit from the strategy. Garner (1990) offers five reasons why learners may receive instruction in the use of a strategy but fail to take action to use a strategy:

1. Poor Cognitive Monitoring – The learner may be unaware that the learning goal is not being met, and thereby may be unaware that a strategic remedy is needed.

2. Primitive Routines That Get the Job Done – A learner may cling to familiar learning routines even though the familiar routines are ineffective for the present learning purpose.

3. Meager Knowledge Base – A deficiency in learner knowledge may impair learner ability to apply a strategy. The learner may be unable to take action to use a strategy because the learner lacks sufficient domain knowledge or sufficient knowledge of the learning objective.

4. Attributions and Classroom Goals That Do Not Support Strategy Use – Learners may believe that the time and effort to use strategies will make no difference in achievement of learning goals, or the classroom

environment may discourage learner use of learning strategies. Learners are less likely to make the effort to use learning strategies when learners attribute failure to achieve learning goals to lack of ability rather than insufficient effort. Further, when a classroom environment emphasizes competition among learners, then learners are more likely to attribute failure to achieve learning goals to lack of ability. Attributions of learning success or failure by learners to ability diminish the benefit received by learners from the effort to use learning strategies.

5. Minimal Transfer of Strategic Activity to New, Related Situations – Learners may be unable to apply a learning strategy in a situation other than the instructional setting, despite a strong relationship between the two situations. Transfer of the learning strategy from the instructional setting is generally not spontaneous and must be prompted.

Summary of Research in Metacognition and Cognitive Strategies

In summary, metacognition might be described as the awareness of thinking processes with conscious regulation of thinking processes and learning strategies to achieve learning goals. Learners more efficient at achieving learning goals generally have better metacognitive regulation skills than less-efficient learners (Brown, 1980, 1987; Henderson, 1986; Wang & Peverly, 1986; Zimmerman, 1990; Zimmerman & Martinez-Pons, 1986). Metacognitive regulation skills can be taught and changes in metacognitive regulation skills have been shown to be associated with increased learning performance (Brown, 1980, 1987; Brown & Palincsar, 1982, Brown, Palincsar, & Armbruster, 1984, Derry &

Murphy, 1986; Paris & Oka, 1986; Redding, 1990; and Wong & Jones, 1982). Three types of training methods used to teach metacognitive regulation have been the blind method, the informed instruction method, and the self-control method. Types of training methods have been combined in metacognitive regulation instruction with positive results (Nolan, 1991; Paris & Oka, 1986). Of the three types of training methods for teaching metacognitive regulation, the informed instruction and self-control instruction types offer the best chance for transfer of the skills learned to other learning tasks (Brown & Palincsar, 1982: Derry, 1989; Osman & Hannafin, 1992). Instructional design which includes use of cognitive strategies may help students be more active in constructing knowledge and thereby increase the power of the instructional design (West, et al., 1991). Yet despite instruction in cognitive strategies appropriate for a given learning task, students may sometimes fail to put the strategies into use (Garner, 1990).

PREVIOUS RESEARCH IN ACCOUNTING EDUCATION

Extent of Previous Research

There is relatively little previous research available which focuses upon accounting education. Relatively little previous accounting research applies principles of cognitive science to accounting education. Stevens and Stevens (1992) reviewed accounting dissertations completed from 1972 to 1989. The purpose of the review was to determine the degree to which accounting dissertations focused upon an educational topic. Stevens and Stevens define educational topic as a focus on "educational research literature, methodology, and/or pedagogy" (p. 273). Of 2,877 accounting dissertations completed from

1972 to 1989, only 68 (2.4%) explored educational topics. Recently the proportion has grown smaller. Of the 1,534 dissertations completed from 1981 to 1989 only 20 dissertations had an educational topic. During the same 1981 to 1989 time period, only 1 of the 20 dissertations which emphasized education was produced at a university ranked by Niemi (1988) among the top 20 research institutions. As recently as October 1, 1989, only one faculty member among the 400 faculty members at the top 20 research universities wrote an education-related dissertation.

Stevens and Stevens (1992) found published education-related articles compared to all articles published by accounting faculty at the top 20 research universities to be as low a percentage as education-related accounting dissertations compared to all accounting dissertations. For 1988, the accounting faculty at the top 20 research universities wrote a total of 1,321 articles published in refereed journals, but only 63 articles (5%) had educational topics.

The Perceived Need for Change Among Accounting Educators

May, Windal, and Sylvestre (1995) surveyed 984 accounting educators, and found evidence of considerable complacency and content with the status quo of accounting education. Although the respondents generally agreed that accounting education was in need of some change, respondents disagreed over the nature and extent of the change. May, Windal, and Sylvestre (1995, p. 28) reported that:

1. Almost 50% of respondents do not agree that fundamental change is needed in curriculum and teaching methods.

2. Almost a third of the respondents believe that students are currently receiving adequate preparation for a professional career in accounting. Further, this group disagreed with the idea that students need to learn to learn on their own.

3. Almost 43% of the respondents disagreed that current educational methods encourage very little creative thinking.

4 Less than half of the respondents agreed that the case method of instruction should replace the current textbook-based, rule-intensive, lecture/problem-solving method of instruction.

The Introduction of Critical Thinking Skills in Accounting Education

Khani, Edwards, Read, Pope, and Freeman (1994) reviewed techniques used by five accounting educators to prepare students better for success in the workplace. The most common teaching technique used by the educators was the case study method. Although a step in the right direction of developing critical thinking skills, the techniques described by the educators seem to fall short of the trailblazing effort called for by the Bedford Committee (American Accounting Association, 1986) or the Accounting Education Change Commission (1990). No educator gave evidence of effort to improve the ability of students to transfer critical thinking skills from a familiar situation to an unfamiliar situation. Further, the techniques the educators described were delivered in coursework placed toward the end of the accounting education program, rather than delivered in introductory coursework and further developed during the program. As Kimmel (1995, p. 299) points out, the problem here is that in order to master case study

problems and problems later in accounting practice, students must first receive training in development of thinking skills to tackle unstructured problems.

Kimmel (1995) proposes a framework to include critical thinking as part of accounting education. Kimmel (1995) matches a course of study in accounting with a four-stage intellectual progression presented below described by Kurfiss (1989) and supported by the research of Kitchener (1986):

> Level One: At the first level of intellectual development, knowledge is thought to be a collection of indisputable facts.
>
> Level Two: Progression to the second level of intellectual development occurs when an individual both recognizes the existence of ambiguity then addresses ambiguity with unsupported opinions.
>
> Level Three: Individuals achieve level three of intellectual development upon realizing the need for evidence to support opinions. At stage three individuals also come to believe that everything is relative, that there is no one correct solution, since any solution is dependent on one's perspective.
>
> Level Four: At level four, individuals have the ability to weigh alternative positions and choose one among several competing ones. Kurfiss (1989, p. 45) argues that critical thinking can occur only at levels three and four, because only at levels three and four do individuals recognize the ambiguities inherent in knowledge and find means to make sense of multiple choices of belief and action.

Kitchener (1986) places most college freshman at the first level of intellectual development and further asserts that level four is difficult to achieve

until an individual is in his or her mid-to-late twenties, regardless of education. However, age seems no guarantor of critical thinking ability; an individual needs both maturity and training. Kitchener (1986) also shows that adult college freshmen, with ages ranging from mid-twenties to fifties, are at the same level of intellectual development as younger students. Kitchener (1986) declares that education should enable individuals to achieve the highest level of intellectual development. Training in critical thinking as part of accounting education will help students attain the highest levels of intellectual development (Kimmel, 1995). Kimmel (1995) suggests that an accounting course should take into account the intellectual stage of development of students enrolled in the course, and further that the course instruction should emphasize critical thinking training elements that help the student attain the next level of intellectual development.

Current Opportunities for Research in Accounting Education

Research in how to teach accounting students to learn how to learn is fairly recent. In the first test of elaboration strategies in an accounting setting, Schadewald and Limberg (1990) tested the effect of self-generated elaboration versus instructor-provided elaboration on student recall of tax laws. Of the 100 undergraduate students in the study, the students who used self-generated elaboration could recall eight percent more material (significant at $p = 0.1$) than students using instructor-provided elaboration. Hermanson (1994) extended the work of Schadewald and Limberg (1990), and examined the difference in self-generated elaboration benefit between 90 high and low ability accounting students. Hermanson (1994) also found that students who used self-generated

elaboration had significantly higher recall ($p = 0.01$), and further showed no significant interaction between students' ability and elaboration method. Choo and Tan (1995) also tested the effect of cognitive elaboration among 140 auditing students, but in addition to the conditions of instructor-generated elaboration and student-generated elaboration, Choo and Tan added the third condition of student-generated elaboration followed by instructor-generated elaboration. Results were that students in the self-generated elaboration condition and students in the self-generated elaboration followed by instructor-generated elaboration performed significantly more like expert auditors than students in the instructor-generated elaboration.

SUMMARY

A handful of authors have pursued research in teaching accounting students to learn how to learn. The inclusion of metacognitive skill training in accounting instruction represents an extension of research in accounting education. Training in metacognition among accounting students offers the promise to develop a component of critical thinking skills for problem solving. Further, metacognitive training offers the possibility for the transfer of skills across learning tasks. Research to improve accounting students' skills in learning to learn responds to the demands made of accounting educators by accounting practitioners.

Chapter 3: Methods

Cognitive research has demonstrated that learning strategies can be taught and learners' metacognitive skills can be increased. The research question for this study is whether increased metacognitive skill is positively correlated with academic performance in accounting. For the purposes of this study metacognition is defined as the combination of knowledge of cognition with the regulation of cognition (Baker & Brown, 1984; Billingsley & Wildman, 1990; Borkowski, et al., 1987, 1988, 1989, 1990; Brown, 1987; Brown & Palincsar, 1982; and Pressley & Ghatala, 1990). Informed training and self-control training methods were combined in the training of subjects. Subjects were trained in the use of three cognitive strategies – a frame type two, a concept map, and an image.

RESEARCH SETTING

Southwestern Community College

The research was conducted at a community college in a large southwestern city. The community college is celebrating its 25th anniversary this year, and offers courses on six campuses around the greater city area and from various distance learning sites. Average student enrollment in for-credit courses is 26,000 students and is 17,000 students in non-credit courses.

Financial Accounting 1623

This study was performed as part of the course content of Financial Accounting 1623. The traditional course content includes the basic structure of

accounting information together with the theory and methodology of preparation and analysis of a company's financial statements for external users such as creditors, investors, and government agencies. Beginning with the fall semester of 1996 this course was modified to emphasize accounting concepts over accounting methodology. The course was changed from a three credit hour course to a four credit hour course with the addition of a mandatory one hour weekly accounting lab. The textbook for the course is Financial Accounting, 6th edition, 1996, (Skousen, Albrecht, and Stice, 1996). The choice of the textbook was based upon emphasis in the textbook of conceptual knowledge over procedural knowledge.

The software used in the accounting lab is Homework Assistant and Tutor (HAT) by Raymond D. Meservy, 1996, of Brigham Young University. HAT was written specifically to supplement the course textbook with computer-based instruction in accounting. Financial Accounting 1623 credit may be transferred to four year institutions. Students enroll in Financial Accounting 1623 either to meet degree or program requirements or to satisfy personal learning objectives.

The focus of this study was upon the content of the first section of the course textbook for Financial Accounting 1623 with particular emphasis on Chapters Two through Four. In Chapter Two the text presents the various types of accounts used in financial statements. Accounting problems for Chapter Two require students to classify accounts correctly on financial statements. For example, students have to know that Accounts Receivable are a current asset on the Balance Sheet and Rent Expense should be shown on the Income Statement.

Chapter Three builds upon the information presented in Chapter Two. Chapter Three presents how accounts and financial statements relate to each other. Problems for Chapter Three require students to make journal entries to reflect economic events taking place in the company. For example, students must know that if a company bought Inventory for cash then the journal entry would increase Inventory under current assets on the Balance Sheet and decrease Cash on the Balance Sheet.

Chapter Four builds upon the information in Chapters Two and Three. Chapter Four presents how and why accounts are updated so that the most accurate and current information is presented in the financial statements as of the date shown. Accounting problems for Chapter Four require students to determine the appropriate adjusting entries to accounts needed to update the accounts to the correct current amount. For example, students must know that if a company received payment for services in advance and that at the end of the year a portion of those services have been rendered, then Unearned Revenues under current liabilities on the Balance Sheet would decrease and Revenues on the Income Statement would increase. The first four chapters of the text serve as the foundation for learning the material in the following chapters.

Students from four sections of Financial Accounting 1623 voluntarily participated in this study. Two instructors each taught two sections of the course. Both instructors are Certified Public Accountants and have substantial previous experience in teaching Financial Accounting as well as in accounting practice. Each instructor taught one control group class and one treatment group class in

order to minimize potential variance in classroom instruction and climate. The classes of each instructor were randomly assigned either to the treatment group or to the control group. All lab sessions were taught by one of the two instructors.

Subjects

Subjects in this study were 81 students enrolled in four sections of the Financial Accounting 1623 course at the community college. The community college requires only that students enrolling in courses have completed high school or the equivalent. There is no additional academic admission standard for students to meet and there is no previous coursework requirement for enrollment in Financial Accounting. Students varied in age, race, and also in academic ability as measured by previous college or high school coursework. Most of the students had no previous educational background in accounting, although some had previously started the course but had failed to complete the course. The subjects in this study were representative of community college students taking an introductory accounting course. No compensation or other incentive was offered or given to students participating in this study.

RESEARCH MATERIALS

HAT is the required computer-based accounting instruction software which accompanies the textbook required for students in Financial Accounting 1623. HAT is written to run in a Windows-based operating environment. This study used two versions of HAT. All subjects in this study received one of the two versions of HAT. The version of HAT received by the control group was the original version written for use in the accounting lab and to accompany the

textbook. HAT was modified to include cognitive strategy tools and metacognitive training in order to explore the research questions in this study. The treatment group received the modified version of HAT.

The Unmodified Computer-based Instruction (Control Group)

The original version of HAT provides computer-based instruction consistent with the text-based instruction for Financial Accounting 1623. HAT includes most of the problems in the textbook but allows students to work independently on the solution of these problems in a computer-based environment. To solve problems students drag and drop answers at the correct location on the appropriate financial statement.

The HAT software screen displays a button linked to a hint function and a button linked to a problem checking function. Students may elect to receive guidance on a problem step solution by clicking on the Hint button. Students may elect to receive feedback on the accuracy of an entered solution to a problem step by clicking on either the Hint button or the Check button.

The Modified Computer-based Instruction (Treatment Group)

The original software allows students to work independently to solve accounting problems. Students work directly with financial statements to solve the problems. A hint function provides support for students in solving the problem. The original software was modified to explore the research question of this study. The author of the original software program made all modifications to the software. Modifications to the software included the addition of three cognitive strategy tools appropriate to accounting together with other

modifications intended to increase metacognitive skills. Descriptions of the modifications follow.

During the first two problem steps a reminder is displayed for the student to remember to identify what happened and thereby what changed in order to be able to determine the correct entry. The purpose of this modification was to increase the students' metacognitive regulation skills of monitoring, control, and evaluation.

The Hint feedback received by students was modified. When a student accessed the Hint function of the software to receive guidance in the solution to a problem step, the first hint displayed was the answer to the question "What happened?" Similarly, if the Hint function was accessed again for the same problem step the hint window displayed both the first hint answer together with the answer to the question "What changed?" The purpose of the two questions was to improve students' metacognitive skills of awareness of cognition and the regulation skills of monitoring, control, and remediation. All other hints provided students remained intact and unmodified. The unchanged, unmodified hints provided feedback to students about out-of-balance entries, incorrect amounts, number of accounts, or classifications used in an entry, and notice if the problem step was solved correctly. Appendix D presents examples of the supplemental hints placed in the modified software for each problem step, together with the learning objective for each problem.

The manner of solving problems was modified. Students dragged and dropped answers to slots of a frame type two instead of directly to financial

statements. The frame type two, called the Frame, displays the expanded accounting equation and shows the relationship of the income statement to the balance sheet. The Frame is intended to improve students' ability to regulate the metacognitive activities of planning, monitoring, control, and evaluation while students attempt to solve accounting problems correctly. A frame type two is a very powerful cognitive strategy tool capable of conveying a very high amount of information and capable of promoting long-term recall (West, et al., 1991). Appendix E presents an example of the type two frame used in this study.

A concept map cognitive strategy tool, called the Map, was added to the software. The Map is intended to guide students in visualizing the relationship of the elements of the accounting equation. A concept map conveys a high amount of information with good prospects of long-term recall (West, et al., 1991). To access the Map students click on a button displayed on the menu bar of the software. Appendix F presents an example of the cognitive map used in this study.

An image cognitive strategy tool, called ALICE, was added to the software. ALICE is designed to promote recall by students of whether debits or credits increase a specific type of account. An image conveys a high amount of information with good prospects of long-term recall (West, et al., 1991). To access ALICE students click on a button displayed on the menu bar of the software. Appendix G presents an example of the ALICE image used in this study.

Questions to be answered by students were added. Students were required to enter a response. Upon opening a problem, a student was required to enter a response to the question "What is your learning objective for this problem?" The student response must be saved by the student to continue, whereupon the software returns the message "Was your response similar to ..." with a button for YES and a button for NO. The student must click either button to proceed. Learning objectives here were not formal statements and students received no training in writing formal learning objectives. Learning objectives for problems were taken from the course textbook. The learning objectives used in the modified software described the activity in which the student was to engage in order to solve the problem. Typical learning objectives in the modified software were to record journal entries correctly or to correctly update account balances to current amounts. The purpose of this modification was to increase the students' metacognitive regulation skill of planning. Appendix D presents sample learning objective responses given students for each problem.

Upon completing the problem the student was required to respond to four evaluation questions by clicking on a response button for each question. The evaluation questions intended to increase students' metacognitive skills of awareness of cognition and regulation skills of planning and evaluation. The evaluation questions also gathered information for future analysis about student strategy use and attitude toward strategy use. The four evaluation questions were:

1. In general, how well do you think you learned the material covered by this problem?

2. Did you understand how to use the learning strategy to meet your learning goal?

3. Will you use the strategy in the future on your own?

4. Did you enjoy using the strategy?

The software was modified to capture all student entries for learning objectives, student responses to exit questions, the number of times students accessed the Hint, and the number of times a student accessed each cognitive strategy. The following Table 3.1 summarizes the modifications made to the software and the purpose of the modifications.

Table 3.1 Description of Software Modifications and Purpose

Modification	Purpose
Reminder questions "What happened?" and "What Changed? were displayed during the first two problem steps of each problem	Increase metacognitive regulation skills of monitoring, control, and evaluation
Problem solution hints were supplemented to include hints in the form of answers to the reminder questions	Increase metacognitive skill of awareness of cognition and regulation skills of monitoring, control, and remediation
The method of problem solution was changed to require use of a type two frame	Increase ability to regulate metacognitive activities of planning, monitoring, control, and evaluation
A button was added which displayed a concept map of the expanded accounting equation	To guide students in visualizing the relationship of accounts
A button was added which displayed the ALICE image	To promote recall of whether a debit or credit increases a specific account
An entry question was displayed each time a problem was opened which required the learner to enter a learning objective appropriate to the problem	Increase the metacognitive regulation skill of planning
Exit questions were displayed each time a learner saved a problem solution. The questions required the learner to enter his or her opinion of the degree to which the problem content was mastered, his or her opinion of the degree to which he or she understood how to use strategy to solve the problem, whether learner would use the strategy in the future, and whether the learner had fun	Increase the metacognitive skill of awareness of cognition, increase the metacognitive regulation skills of planning and evaluation, and gather information on future use and current attitude toward strategy use

Pilot Test of Modified Computer-Based Instruction

A pilot study was conducted to test the effect of the software modifications upon student metacognitive skill levels and use of cognitive strategies. Ten subjects volunteered to participate in the study. Subjects ranged in age from 19 to 42 years old. All subjects had completed high school, five had completed college, and two had obtained graduate degrees. None of the subjects had previously had formal training in financial accounting.

Metacognitive skill levels were measured with 25 questions taken from the Motivated Strategies for Learning Questionnaire (MSLQ), (Pintrich, Smith, Garcia, & McKeachie, 1991). The 25 questions chosen were those on the MSLQ which specifically measured cognitive strategy use and metacognitive skills. The subjects responded to the 25 questions at the beginning of the study and again at the end of the study.

The subjects in the study were taught to use the modified software to solve accounting problems and the solutions were tested for correctness. The study was conducted in three one hour sessions spanning three to four days. Each session focused on problems from a single chapter in the textbook. Each subject correctly solved two problems at each session. No textbook was used to supplement the software instruction; the researcher supplied whatever technical instruction was required to allow subjects to solve problems.

Analysis of the changes in subject responses on the 25 question instrument found an overall difference in posttest mean scores compared to pretest mean scores. The overall difference was statistically significant at an alpha level of .05.

Differences in the mean scores for eight individual questions were statistically significant at an alpha level of .05.

The pilot study data was multiplied by a factor of eight to simulate a sample size of 80 subjects, near the number of subjects expected in this study. The inflated data showed that differences in the mean scores for 17 individual questions could be statistically significant at an alpha level of .05.

The purpose of the pilot study was to test the likelihood that the modified software would affect student's levels of metacognitive skill and students' use of cognitive strategies. Based upon the levels of significance found among the pilot study data despite the small number of subjects, the modifications made to the software seemed to promote changes in students' metacognitive skill and students' use of cognitive strategies.

TRAINING OF SUBJECTS

Training for All Groups

Training for both the control group and the treatment group shared a common objective. The objective was that students should be able to use the features of the software in the solution of accounting problems. Students achieved the objective by completing the demonstration part of the software and correctly solving two assigned accounting problems. Training of students occurred in the accounting lab at the start of the course Financial Accounting 1623. The lab course instructor conducted all training sessions. Training methods were direct explanation by the instructor and self-guided practice by the students in using the software to solve accounting problems correctly.

Additional Training for the Treatment Group

The training for the treatment group included three additional objectives: (1) to learn the purpose of the three cognitive strategy tools, (2) to learn how to use the tools, and (3) to learn when to use the tools. The cognitive strategy tools were presented to students as the Thinking Toolkit. Treatment group students received instruction in the purpose of the Frame, Map, and ALICE cognitive strategy tools as well as instruction in when and how to use the tools. Informed and self-control training methods were used to instruct the students. Informed training provided the students with an explanation of how and why to use a cognitive strategy, and self-control training instructed students in metacognitive regulation skills such as planning, monitoring, control, evaluation, and remediation.

Previous studies have demonstrated that an effective metacognitive skill training program includes: (a) practice in the use of appropriate cognitive strategies, (b) training in regulation of the use of appropriate cognitive strategies, and (c) instruction in why and when to use a cognitive strategy (Brown and Palincsar, 1982; Brown, Palincsar, & Armbruster, 1984). Training students' knowledge of cognition in this study focused on informing students of the available cognitive strategies appropriate to the learning task together with guided practice in the use of the learning strategies. Training students' regulation of cognition in this study included training with guided practice in: (a) why a particular cognitive strategy was appropriate for a learning task, (b) how to apply the cognitive strategy to the learning task, (c) evaluation of whether or not the

learning task was successfully achieved, (d) if the learning task was not successfully achieved then re-examination of the application of the cognitive strategy for correctness or selection of an additional strategy to apply and (e) rehearsal of the previous four steps.

Training occurred in the following sequence of steps:

Step 1 – Introduction: The lab instructor demonstrated the use of the tutorial portion of the software program. The tutorial first informed students that the software includes a collection of tools called the Thinking Toolkit to help students think about thinking and improve students' critical thinking skills. The software informed students that critical thinking skills are very important to success in all professions and very helpful for academic success in the present accounting course.

Step 2a – The Frame: The lab instructor identified to students the individual tools in the Thinking Toolkit. The first tool shown to students was the Frame, a frame type two learning strategy. The Frame organizes accounting information in the format of the expanded accounting equation. The lab instructor informed students that a frame can organize a great deal of information and a frame is appropriate to use if the information is subject to known law-like principles. The lab instructor demonstrated to students that clicking on an element of the Frame would cause the definition of the element to be displayed. The lab instructor informed students that in order to get the most benefit from using the Frame, students should ask themselves three questions: (1) What happened? –

this question guides students to identify the economic event which has occurred, such as "The company paid cash for inventory", (2) What changed? – this question guides students to identify what accounts changed as the result of what happened, such as "Inventory went up and cash went down" from the first question, and (3) What is the entry? – this question guides students to determine the appropriate accounting entry based upon what accounts the student identified as changed and the direction of the changes, such as "Debit Inventory and Credit Cash." The Frame display in the tutorial includes explanatory text similar to the explanation given students by the instructor. To train and test students in the use of the Frame, students were given guided practice in solving accounting problems and solutions were checked for accuracy. Guided practice consisted of use of the frame by students to solve accounting problem steps together with personal guidance from the lab instructor in frame use. Guided practice continued until students correctly solved three accounting problem steps in succession.

Step 2b – The Map: The next tool demonstrated to students by the lab instructor was the Map. The Map is a concept map of the basic accounting equation and unfolds to become the expanded accounting equation. Students were informed that the Map is a roadmap of how accounting information is organized. The Map display includes explanatory text similar to the explanation given students by the instructor. To train and test students in the use of the Map, students were given

guided practice in classifying various accounts and classifications were checked for accuracy. Guided practice consisted of use of the map by students to classify accounts together with personal guidance from the lab instructor in map use. Guided practice continued until students could classify accounts correctly three successive times.

Step 2c – ALICE: The last tool shown to students was ALICE, an imagery learning strategy. ALICE is an acronym for five accounts types of Assets, Liabilities, Income (same as revenue), Capital (same as equity), and Expenses. One of the instructors in this study has used the ALICE image in classroom instruction for several years and found that students easily retain the ALICE image. The purpose of ALICE is to help students correctly identify whether a debit or credit records the change in a particular account. The image displays the letters of ALICE written vertically with a column for debits and a column for credits shown to the right of the letters. Next to each letter of ALICE a plus sign is placed in the appropriate column to indicate whether a debit or a credit increases the account type. Lastly, a curved line is drawn through each of the plus signs. The curved line suggests that ALICE is pregnant in order to make the image more clear, distinct, and forceful to the student and thereby more memorable. According to West, et al. (1991), an image will have more instructional power if the image has clarity, distinctness, forcefulness, and emotionality. The ALICE display includes explanatory text similar to the explanation given students by the instructor. To train

and test students in the use of ALICE, students were given guided practice in determining whether debits or credits increased various accounts and answers were checked for accuracy. Guided practice consisted of use of ALICE by students to determine debits and credits together with personal guidance from the lab instructor in ALICE use. Guided practice continued until students could correctly determine three successive times whether debits or credits increased various accounts.

Step 3 – Regulation Training: After the explanation of the nature, use, and purpose of the tools in the Thinking Toolkit, the lab instructor guided students through the application of the tools to solve an entire accounting problem. The problem required students first to enter the learning objective for the problem and save the entry. Next the problem displayed the problem text and a suggestion box for the first two problem steps. The suggestion box prompted students to ask themselves first "What happened?" then "What changed" then "What is the entry?" As students worked with guidance through the solution of the problem, students were required to perform the physical actions necessary to solve the problem. The lab instructor showed students that for each problem step there are hints which may be accessed by clicking on the Hint button. The lab instructor explained that hints help students get started on a problem step and provide feedback on students' solutions to the problem step. The first hint given students addressed "What happened." If the student requested another hint the second hint addressed "What changed." After entering a

solution to the problem step, problem specific hints help a student check the solution to the problem step. If the solution to the problem step is correct, the hint returns "Your answer is correct!" with a smiley face. After students were guided through the use of the learning tools to solve an accounting problem, the lab instructor reviewed for students the contribution of each tool to the problem solution. Students then were given guided practice in choosing tools from the Thinking Toolkit to solve accounting problems correctly. Guided practice consisted of students choosing the correct tool for a problem or question problems together with personal guidance from the lab instructor until the student chose the correct tool three times in succession.

Step 4 – Rehearsal and Achievement of Learning Objectives: The last step in training students in why, how, and when to use the tools available in the Thinking Toolkit was to confirm that students had internalized the information presented in the first three steps above. Students were tested in the use of the tools to determine whether students had internalized the information presented. Achievement was measured by whether students could use the learning strategy tools in a new situation. The test first reminded students of why and when each learning tool was used. Next, students were asked to describe a version of each Frame, Map, and ALICE learning tool appropriate to a new learning situation. Student responses were printed at the time of the test. The test was administered again later

in the study to confirm that students retained knowledge of why and how to use the learning tools.

MEASUREMENT INSTRUMENTS

Measurement of Cognitive and Metacognitive Skill

The Motivated Strategies for Learning Questionnaire (MSLQ) was used to capture students' levels of cognitive and metacognitive skill (Pintrich, et al., 1991). The MSLQ is a Likert-scaled self-report instrument designed to be given in class in 20-30 minutes. The questionnaire contains a section focused upon students' motivation to learn and a section focused upon students' use of cognitive and metacognitive strategies to learn. Six scales assess motivation and nine scales assess learning strategies. The 15 scales are independent and may be used individually or grouped according to the need of the researcher (Pintrich, et al., 1991, p. 3).

The section on motivation contains 31 items which assess students' goals, value beliefs, and beliefs about ability to succeed in a specific course. The 31 items group into six scales: (1) intrinsic goal orientation, (2) extrinsic goal orientation, (3) task value, (4) control of learning beliefs, (5) self-efficacy for learning and performance, and (6) test anxiety.

Pintrich, et al. (1991, p. 9-15) describe the components of the six motivation scales in detail. The descriptions presented below are taken directly from the manual containing the MSLQ (Pintrich, et al. (1991):

> Intrinsic Goal Orientation Goal orientation refers to the student's perception of the reasons why she is engaging in a learning task. On the MSLQ, goal orientation refers to student's general goals or orientation to

the course as a whole. Intrinsic goal orientation concerns the degree to which the student perceives herself to be participating in a task for reasons such as challenge, curiosity, mastery. Having an intrinsic goal orientation towards an academic task indicates that the student's participation in the task is an end all to itself, rather than participation being a means to an end (p. 9).

Extrinsic Goal Orientation Extrinsic goal orientation complements intrinsic goal orientation and concerns the degree to which the student perceives herself to be participating in a task for reasons such as grades, rewards, performance, evaluation by others, and competition. When one is high in extrinsic goal orientation, engaging in a learning task is the means to an end. The main concern the student has is related to issues that are not directly related to participating in the task itself (such as grades, rewards, comparing one's performance to that of others). Again, this refers to the general orientation to the course as a whole (p. 10).

Task Value Task value differs from goal orientation in that task value refers to the student's evaluation of the how interesting, how important, and how useful the task is ("What do I think of this task?"). Goal orientation refers to the reasons why the student is participating in the task ("Why am I doing this?"). High task value should lead to more involvement in one's learning. On the MSLQ, task value refers to students' perceptions of the course material in terms of interest, importance, and utility (p. 11).

Control of Learning Belief Control of learning refers to students' beliefs that their efforts will result in positive outcomes. It concerns the belief that outcomes are contingent on one's own effort, in contrast to external factors such as the teacher. If students believe that their efforts to study make a difference in their learning, they should be more likely to study more strategically and effectively. That is, if the student feels that she can control her academic performance, she is more likely to put forth what is needed strategically to effect the desired changes (p. 12).

Self-Efficacy for Learning and Performance The items comprising this scale assess two aspects of expectancy: expectancy for success and self-efficacy. Expectancy for success refers to performance expectations, and relates specifically to task performance. Self-efficacy is a self appraisal of one's ability to master a task. Self-efficacy includes judgments about one's ability to accomplish a task as well as one's confidence in one's skills to perform a task (p. 13).

> Test Anxiety Test anxiety has been found to be negatively related to expectancies as well as academic performance. Test anxiety is thought to have two components: a worry, or cognitive component, and an emotionality component. The worry component refers to students' negative thoughts that disrupt performance, while the emotionality component refers to affective and physiological arousal aspects of anxiety. Cognitive concern and preoccupation with performance have been found to be the greatest sources of performance decrement. Training in the use of effective learning strategies and test-taking skills should help reduce the degree of anxiety (p. 15).

The section on strategies contains 50 items, subdivided into 31 items addressing students' use of cognitive and metacognitive strategies and 19 items addressing students' management of resources. The 50 items group into nine scales: (1) cognitive and metacognitive strategies – rehearsal, (2) cognitive and metacognitive strategies – elaboration, (3) cognitive and metacognitive strategies – organization, (4) cognitive and metacognitive strategies – critical thinking, (5) cognitive and metacognitive strategies – metacognitive self-regulation, (6) resource management strategies – time and study environment, (7) resource management strategies – effort regulation, (8) resource management strategies – peer learning, and (9) resource management strategies – help seeking.

Pintrich, et al. (1991) describe the components of the nine learning strategies scales in detail. The descriptions presented below are taken directly from the manual containing the MSLQ (Pintrich, et al. (1991):

> Cognitive and Metacognitive Strategies – Rehearsal Basic rehearsal strategies involve reciting or naming items from a list to be learned. These strategies are best used for simple tasks and activation of information in working memory rather than acquisition of new information in long-term memory. These strategies are assumed to influence the attention and encoding processes, but they do not appear to help students construct internal connections among the information or integrate the information with prior knowledge (p. 19).

Cognitive and Metacognitive Strategies – Elaboration Elaboration strategies help students store information into long-term memory by building internal connections between items to be learned. Elaboration strategies include paraphrasing, summarizing, creating analogies, and generative note-taking. These help the learner integrate and connect new information with prior knowledge (p. 20).

Cognitive and Metacognitive Strategies – Organization Organization strategies help the learner select appropriate information and also construct connections among the information to be learned. Examples of organizing strategies are clustering, outlining, and selecting the main idea in reading passages. Organizing is an active, effortful endeavor, and results in the learner being closely involved in the task. This should result in better performance (p. 21).

Cognitive and Metacognitive Strategies – Critical Thinking Critical thinking refers to the degree to which students report applying previous knowledge to new situations in order to solve problems, reach decisions, or make critical evaluations with respect to standards of excellence (p. 22).

Cognitive and Metacognitive Strategies – Metacognitive Self-Regulation Metacognition refers to the awareness, knowledge, and control of cognition. We have focused on the control and self-regulation aspects of metacognition on the MSLQ, not the knowledge aspect. There are three general processes that make up metacognitive self-regulatory activities: planning, monitoring, and regulating. Planning activities such as goal setting and task analysis help to activate, or prime, relevant aspects of prior knowledge that make organizing and comprehending the material easier. Monitoring activities include tracking of one's attention as one reads, and self-testing and questioning: these assist the learner in understanding the material and integrating it with prior knowledge. Regulating refers to the fine-tuning and continuous adjustment of one's cognitive activities. Regulating activities are assumed to improve one's performance by assisting learners in checking and correcting their behavior as they proceed on a task (p. 23).

Resource Management Strategies – Time and Study Environment Besides self-regulation of cognition, students must be able to manage and regulate their time and their study environments. Time management involves scheduling, planning, and managing one's study time. This includes not only setting aside blocks of time to study, but the effective use of that study time, and setting realistic goals. Time management

varies in level, from an evening of studying to weekly and monthly scheduling. Study environment management refers to the setting where the student does her class work. Ideally, the learner's study environment should be organized, quiet, and relatively free of visual and auditory distractions (p. 25).

Resource Management Strategies – Effort Regulation Self-regulation also includes students' ability to control their effort and attention in the face of distractions and uninteresting tasks. Effort management is self-management, and reflects a commitment to completing one's study goals, even when there are difficulties or distractions. Effort management is important to academic success because it not only signifies goal commitment, but also regulates the continued use of learning strategies (p. 27).

Resource Management Strategies – Peer Learning Collaborating with one's peers has been found to have positive effects on achievement. Dialogue with peers can help a learner clarify course material and reach insights one may not have attained on one's own (p. 28).

Resource Management Strategies – Help Seeking Another aspect of the environment that the student must learn to manage is the support of others. This includes both peers and instructors. Good students know when they don't know something and are able to identify someone to provide them with some assistance. There is a large body of research that indicates that peer help, peer tutoring, and individual teacher assistance facilitate student achievement (p. 29).

Development of the MSLQ began informally in 1982 and formally in 1986. Pintrich, Smith, Garcia, and McKeachie (1993) reported on the reliability and predictive validity of the MSLQ. Reported reliability coefficients are high for the MSLQ and range from an alpha of .52 to .93 with 11 of the 15 scales at .74 or above. Predictive validity of the instrument, measured as correlation with a student's final grade in a course, showed significant correlation in the expected direction. Reported internal consistency of the questionnaire items also was good. "The MSLQ seems to represent a useful, reliable, and valid means for assessing

college students' motivation and use of learning strategies" (Pintrich, et al., 1993, p. 812). Appendix H presents the MSLQ used in this study.

Measurement of Academic Achievement

All subjects received the same academic achievement examination. The accounting achievement test was developed jointly by the two instructors in this study. Test questions were drawn from the textbook publisher's testbank. The questions in the testbank indicated which learning objective the question intended to measure. The testbank questions chosen measured the learning objectives used as the focus of instructional delivery by the course instructors. Both instructors reviewed the test, first independently and then together, to confirm face and content validity of the test questions.

The test contained 20 multiple choice questions and three problem questions. Seven of the multiple choice questions required calculations and 13 of the multiple choice questions were conceptual in nature. Each multiple choice answer was worth 3.5 points. The three problem questions required a total of 14 responses worth 2 points each. Appendix I presents the accounting academic achievement test used in this study.

EXPERIMENTAL DESIGN AND STATISTICAL METHODS

Study Design Factors

Students in the control group and students in the treatment group were members of separate intact classes. Therefore, students could not be randomly assigned to a control or treatment group. The selection of instructors in the study was not random. One of the instructors is the researcher. The other instructor

taught two sections of the same course at the same campus location. Classes and accompanying lab sessions of each instructor were randomly assigned either to the control group or the treatment group. The researcher in this study was the lab instructor. The researcher supervised and instructed all sections of the required lab sessions. The treatment effect of interest in this study was delivered in the software and was not delivered by the lab instructor.

Experimental Design Selected

The experimental design in this study was factorial, completely crossed. Each of the two instructors in this study taught two classes. One class taught by each instructor was randomly selected to be the treatment group. The statistical method of analysis chosen for this study was analysis of covariance, ANCOVA. The independent variable was the treatment condition. Concomitant variables were instructor and pretest scores on the measure of metacognitive skill. Concomitant variables were selected to control variance between classroom instruction and variance between treatment and control group initial metacognitive skill levels. Dependent variables were levels of metacognitive skill at the end of the study and academic performance.

HYPOTHESES

There were three hypotheses for this study.

Hypothesis One: Students who use software modified to include metacognitive skill training will report significantly higher scores on the MSLQ measurement of metacognition and learning strategy use than reported by students who do not use the modified software.

Hypothesis Two: Students who use software modified to include metacognitive skill training will obtain significantly higher scores on an academic achievement test than students who do not use the modified software.

Hypothesis Three: Increased metacognitive skill levels will be positively correlated with higher academic achievement among students who use software modified to include metacognitive skill training.

To test these hypotheses the MSLQ was administered as a pretest measure to both the treatment and control groups at the start of the Financial Accounting 1623 course in order to obtain values for the entry level of metacognitive skill covariate. Both the treatment and control groups successfully learned to use the HAT software at the start of the study. The instructors used the same course syllabus to eliminate as much variance as possible in classroom instructional content. To test Hypothesis One the MSLQ instrument was administered to both the treatment and control groups at the end of the study as a posttest measure to obtain values for the ending level of metacognitive skill dependent variable. To test Hypothesis Two an academic achievement test was given to all students at the end of the study to obtain values for the academic performance dependent variable. The same test was used for both the treatment and control groups. To test Hypothesis Three, an analysis of correlation was performed between the two dependent variables of academic performance and metacognitive skill.

SUMMARY

This study took place at a local community college. Subjects were students enrolled in Financial Accounting 1623, an introductory course in accounting. Two instructors each taught two sections of students. For each instructor a class was randomly assigned to the control group; the other class became the treatment group. The course requirements included a mandatory lab.

In the required lab students used computer-based instructional software to solve accounting problems. For the treatment group, the computer-based instruction used in the lab was modified to include the use of cognitive strategies and training to promote increased metacognitive skill. Students in the control group received the original, unmodified computer-based instruction. All students were trained in the use of the software, and the treatment group received additional training in why, how, and when to use the cognitive strategies included in the modified software.

This study investigated three questions. The first research question was whether students who use software modified to include metacognitive skill training will significantly increase metacognitive skill levels compared to students who do not use modified software. The research hypothesis was that students who use software modified to include metacognitive skill training will report significantly higher scores on the MSLQ measurement of metacognition and learning strategy use than reported by students who do not use the modified software.

The second research question was whether students who use software modified to increase metacognitive skill levels will achieve significantly higher performance on an accounting test than students who do not use modified software. The research hypothesis was that students who use software modified to include metacognitive skill training will obtain significantly higher scores on an academic achievement test than students who do not use the modified software.

The third research question was whether the increase in metacognitive skill levels will be positively correlated with the increase in academic performance among students using software modified to include metacognitive skill training. The research hypothesis was that increased metacognitive skill levels will be positively correlated with higher academic achievement among students who use software modified to include metacognitive skill training.

The Motivated Strategies for Learning Questionnaire (MSLQ) was used to measure levels of metacognitive skill. A written examination given to all subjects was used to measure academic performance.

The independent variables in this study were group membership in either the treatment or control group, beginning levels of metacognitive skill, and instructor. The beginning level of metacognitive skill and instructor variables were covaried to control the effect of nuisance variance. The dependent variables in this study were academic performance and metacognitive levels at the end of the study. Analysis of covariance was used to test Hypotheses One and Two, and correlation analysis was used to test Hypothesis Three.

Chapter 4: Results

INTRODUCTION

This study addressed three questions. First, would students who use software modified to include metacognitive skill training significantly increase metacognitive skill levels compared to students who do not use modified software? Second, would students who use software modified to increase metacognitive skill levels achieve significantly higher performance on an accounting test than students who do not use modified software? Third, will the increase in metacognitive skill levels will be positively correlated with the increase in academic performance among students using software modified to include metacognitive skill training?

Quantitative analysis was performed using parametric statistical analysis, specifically analysis of covariance (ANCOVA) and analysis of variance (ANOVA). ANCOVA was used to control for variance in instructor and initial metacognitive skill. ANCOVA was used in all analyses where the homogeneity of group regressions test was met. ANOVA was used for those analyses where the homogeneity of group regressions test was not met. All statistical tests of significance were conducted at an alpha level of .05. The computer software package used to perform the statistical analyses was SPSS® for Windows, version 7.5.1.

The Motivated Strategies for Learning Questionnaire (MSLQ) was used to measure students' levels of cognitive and metacognitive skill. Higher scores on

the MSLQ indicate higher levels of cognitive and metacognitive skills. A total of 81 students returned pretest responses to the MSLQ. A total of 58 students submitted both pretest and posttest MSLQ responses. Data was analyzed only from those students who submitted both pretest and posttest MSLQ forms, in order to be able to use pretest MSLQ responses as covariates. The treatment group contained 34 students and the control group contained 24 students. Test scores from the first semester financial accounting examination were obtained for all 58 students. The same examination was used for all 58 students.

Descriptive statistics are listed first in order to describe the demographics of the study sample. The results of the ANCOVA and ANOVA procedures used to test the study hypotheses are presented after the description of the sample group.

Demographic Information for the Sample

Overall, the study sample group is characterized as ethnically diverse, working students enrolled both full-time and part-time. The study sample group contained 32 male students and 26 female students. Of the 58 students, 46 graduated from high school in 1992 or more recently. Exactly half the students were Caucasian. A total of 16 students, or 28%, were Hispanic. Over half of the sample group plan to take at least two more accounting courses. A majority of students were enrolled in at least four courses for the semester. On average students worked a little more than 20 hours per week. Demographic information is presented in Tables 4.1 through 4.4.

Table 4.1 below presents the ratio of male and female students in the sample group. The sample contained 32 males, or 55 percent, and 26 females, or 45 percent.

Table 4.1 Gender Composition of the Sample Groups

		Group				Total	
		Treatment		Control			
		Count	%	Count	%	Count	%
Gender	Male	24	70.6%	8	33.3%	32	55.2%
	Female	10	29.4%	16	66.7%	26	44.8%
Totals		34	100.0%	24	100.0%	58	100.0%

The largest ethnic group in the sample were the 29 Caucasian students, 50 percent of the sample. The next largest group in the sample were the 16 Hispanic students, 28 percent of the sample. The sample also included five Asian-American students, 8.6 percent of the sample, and two African-American students, 3.4 percent of the sample group. A total of six students in the sample reported ethnic backgrounds of "Other" and comprised 10.3 percent of the sample group. Table 4.2 summarizes the mix of ethnic background in the sample population.

Table 4.2 Ethnic Background of Sample Groups

		Group				Total	
		Treatment		Control			
		Count	%	Count	%	Count	%
Ethnic Background	Afro-American			2	8.3%	2	3.4%
	Asian-American	1	2.9%	4	16.7%	5	8.6%
	Caucasian	16	47.1%	13	54.2%	29	50.0%
	Hispanic	12	35.3%	4	16.7%	16	27.6%
	Other	5	14.7%	1	4.2%	6	10.3%
Totals		34	100.0%	24	100.0%	58	100.0%

Most members of the sample group plan to take additional accounting courses after the present course is completed. Only three students, 5.2 percent of the sample, intend to take no more courses in accounting. A total of 23 students, or 39.7 percent, intend to take one more accounting course. A total of 14 students, or 24.1 percent, intend to take two more accounting courses. A total of 17 students, or 29.3 percent, intend to take three or more accounting courses. One student in the sample did not give a response to the number of accounting courses planned for the future. Table 4.3 summarizes plans of the sample group to take additional courses in accounting.

Table 4.3 Future Accounting Courses Planned by Sample Groups

		Group				Total	
		Treatment		Control			
		Count	%	Count	%	Count	%
Future accounting courses planned	none	1	2.9%	2	8.3%	3	5.2%
	one	13	38.2%	10	41.7%	23	39.7%
	two	9	26.5%	5	20.8%	14	24.1%
	3 or more	10	29.4%	7	29.2%	17	29.3%
	5	1	2.9%			1	1.7%
Totals		34	100.0%	24	100.0%	58	100.0%

Most students in the sample are enrolled in four or more courses in the current semester. Only two students, 3.4 percent, are taking just Financial Accounting this semester. Six students, 10.3 percent, are taking Financial Accounting and one other course. Thirteen students, 22.4 percent, and 27 students, 46.6 percent, are taking three and four courses respectively this semester. Five students, 17.2 percent, are taking five courses in the current semester. Table 4.4 summarizes the course load for the current semester for students in the sample.

Table 4.4 Current Semester Course Load Among Sample Groups

		Group				Total	
		Treatment		Control			
		Count	%	Count	%	Count	%
Total Course Load	One course	1	2.9%	1	4.2%	2	3.4%
	Two courses	2	5.9%	4	16.7%	6	10.3%
	Three Courses	10	29.4%	3	12.5%	13	22.4%
	Four Courses	15	44.1%	12	50.0%	27	46.6%
	Five or More Courses	6	17.6%	4	16.7%	10	17.2%
Totals		34	100.0%	24	100.0%	58	100.0%

HYPOTHESIS ONE TESTED: METACOGNITIVE SKILL DIFFERENCES

Statistical Analysis Methods Used

When the homogeneity of group regressions test was met, analysis of covariance (ANCOVA) was used to determine if the posttest scores on the MSLQ were significantly different for the treatment group than for the control group. The dependent variable was the posttest MSLQ score. The independent variable was the treatment condition. Class instructor was a covariate to control for variance between instructors. The pretest MSLQ score for the dependent variable was used as a covariate to control for posttest MSLQ score variance caused by initial differences among the sample.

If the homogeneity of group regressions test was not met, then analysis of variance (ANOVA) was used to determine if posttest scores on the MSLQ were significantly different for the treatment group than for the control group. The dependent variable was the posttest MSLQ score. The independent variable was the treatment condition.

Analysis of Learning Strategy Scales Total Score

The first hypothesis of this study stated that treatment group students would report significantly higher scores on the posttest MSLQ measurement of metacognition and learning strategy use than control group students. The MSLQ contains nine separate scales that together measure student metacognition and learning strategy use. The scales "can be used together or singly" (Pintrich, et al., 1991, p. 3). The initial analysis of results examined the total score of the nine scales.

ANCOVA was used to analyze the difference in means between the treatment group and the control group. The homogeneity of group regressions test was met. The independent variable was treatment condition. The dependent variable was the posttest MSLQ total score for learning strategies. Concomitant variables were teacher and the pretest MSLQ total score for learning strategies (variable Premtot).

The treatment group mean was lower than the control group mean. Table 4.5 presents descriptive statistics for the treatment and control group dependent variables. The range of possible mean values is 50 to 350.

Table 4.5 Descriptive Statistics for Total Metacognition Scales

	Group	Mean	Std. Deviation	N
Total Metacognition Scales	Treatment	211.6	33.9	34
	Control	226.9	43.0	24

The control group mean was higher than the treatment group mean for the dependent variable, the total score for all learning strategies scales. However, the difference in means was not statistically significant. Table 4.6 presents the source table from the statistical analysis.

Table 4.6 ANCOVA for Total of All Learning Strategy Scales

Dependent Variable: Total Learning Strategy Scales

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	54534.4[b]	3	18178.1	33.6	.000
Intercept	750.2	1	750.2	1.4	.244
Teacher	1893.6	1	1893.6	3.5	.067
Premtot	49434.8	1	49434.8	91.3	.000
Group	666.8	1	666.8	1.2	.272
Error	29233.4	54	541.4		
Total	2838416.0	58			
Corrected Total	83767.7	57			

b. R Squared = .651 (Adjusted R Squared = .632)

No significant difference on the total of all learning scales was found between groups. Next, each learning strategy scale was tested to determine if any scale indicated a significant difference between treatment and control groups.

ANCOVA was used to test for significant differences when the homogeneity of group regressions test was met. ANOVA was used to test for significant differences when the homogeneity of group regressions was not met. The nine cognitive and metacognitive scales tested were:

1. Rehearsal
2. Elaboration
3. Organization
4. Critical Thinking
5. Metacognitive Self-Regulation
6. Time and Study Environment
7. Effort Regulation
8. Peer Learning
9. Help Seeking

Significant differences in group means were found on two of the nine scales. The control group mean score was significantly higher than the treatment group mean score on the effort regulation strategy scale. The treatment group mean was significantly higher than the control group mean on the peer learning strategy scale. Table 4.7 presents the descriptive statistics for each of the nine learning strategy scales and for the total of all learning strategy scales. Following are the analyses of the effort regulation and peer learning strategy scales. The analysis of the remaining seven scales where no significant difference was found between group means is presented for reference in Appendix A.

Table 4.7 Descriptive Statistics for All Learning Strategy Scales

	Group			
	Treatment		Control	
	Mean	Std Deviation	Mean	Std Deviation
Rehearsal strategies	17.6	4.19	18.5	4.96
Elaboration	25.6	6.70	27.5	6.61
Organization	15.1	4.19	17.1	4.94
Critical thinking	19.8	5.27	21.2	6.36
Metacognition	51.7	8.54	54.5	10.83
Time/study environment	37.4	8.09	41.0	9.86
Effort regulation	18.4	5.13	21.7	4.11
Peer learning	10.6	3.51	9.1	4.19
Help seeking	15.4	4.76	16.3	6.20
All Learning Strategy Scales	211.6	33.89	226.9	43.03

Analysis of the Effort Regulation Strategy Scale

ANCOVA was used initially to analyze the difference in means between the treatment group and the control group. However, the homogeneity of group regressions test was not met. Accordingly, analysis of variance (ANOVA) was used to test the difference in group means. The independent variable was treatment condition. The dependent variable was the posttest MSLQ score for the effort regulation learning strategy scale. Table 4.8 presents descriptive statistics

for the treatment and control group dependent variables. The range of possible mean values is 4 to 28.

Table 4.8 Descriptive Statistics for Effort Regulation Strategies

	Group	Mean	Std. Deviation	N
Effort regulation	Treatment	18.4	5.1	34
	Control	21.7	4.1	24

The control group mean was higher for the posttest effort regulation strategies dependent variable. The difference in means between groups was significant at an alpha level of .05. Table 4.9 presents the source table from the statistical analysis.

Table 4.9 ANOVA for Effort Regulation Strategies

		Sum of Squares	df	Mean Square	F	Sig.
Effort regulation	Between Groups	151.8	1	151.8	6.7	.012
	Within Groups	1259.4	56	22.5		
	Total	1411.1	57			

Analysis of the Peer Learning Strategy Scale

ANCOVA was used to analyze the difference in means between the treatment group and the control group. The homogeneity of group regressions test was met. The independent variable was treatment condition. The dependent variable was the posttest MSLQ score for the peer learning strategy scale. Concomitant variables were teacher and the pretest MSLQ score for the peer

learning strategy scale (variable Prepeer). Table 4.10 presents descriptive statistics for the treatment and control group dependent variables. The range of possible mean values is 3 to 21.

Table 4.10 Descriptive Statistics for Peer Learning Strategies

	Group	Mean	Std. Deviation	N
Peer learning	Treatment	10.6	3.5	34
	Control	9.1	4.2	24

The treatment group mean was higher for the posttest peer learning strategies dependent variable. The difference in means between groups was significant at an alpha level of .05. Table 4.11 presents the source table from the statistical analysis.

Table 4.11 ANCOVA for Peer Learning Strategies

Dependent Variable: Peer learning

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	447.0[b]	3	149.0	20.4	.000
Intercept	25.4	1	25.4	3.5	.067
Teacher	3.5	1	3.5	.5	.494
Prepeer	406.0	1	406.0	55.6	.000
Group	76.1	1	76.1	10.4	.002
Error	394.0	54	7.3		
Total	6621.0	58			
Corrected Total	841.0	57			

b. R Squared = .532 (Adjusted R Squared = .505)

Summary of Hypothesis One Test

Hypothesis One stated that scores on the MSLQ instrument for the treatment group would be significantly higher than for the control group. The treatment group mean differed from the control group mean on each learning strategy scale and on the sum of all learning strategy scales. Except for between group differences on two learning strategy scales (effort regulation and peer group learning), no differences on learning strategy scales between group means were statistically significant at an alpha level of .05. The control group reported significantly higher mean scores than the treatment group on effort regulation. The treatment group reported significantly higher mean scores on peer learning scales than the control group.

On the MSLQ, peer learning is among the resource management sub-group of scales and not among the sub-group of cognitive and metacognitive scales. The significant difference on the peer learning scale aside, the treatment group students did not report significantly higher mean scores on other resource management scales or on scales measuring cognitive and metacognitive strategy use. Given no significant differences found on other cognitive and metacognitive strategy scales, the single significant difference found on the peer learning scale was deemed inadequate to support Hypothesis One. Therefore, Hypothesis One was rejected.

HYPOTHESIS TWO TESTED: ACADEMIC ACHIEVEMENT DIFFERENCES

The second hypothesis of this study stated that students in the treatment group would report significantly higher scores on an academic achievement test

than students in the control group. Analysis of Covariance (ANCOVA) was used to determine if the posttest scores for an academic performance measure were significantly different for the treatment group than for the control group. The homogeneity of group regressions test was met. The independent variable was treatment condition. The dependent variable was student achievement on an accounting test. The class instructor condition was a covariate to control for variance between instructors. The same accounting test was given to all students in the sample. The accounting test was developed jointly by both instructors in the study. The test measured achievement of the instructional material learning objectives. Learning objectives were the same for all students in the sample. Table 4.12 presents descriptive statistics for the treatment and control group test score dependent variable. The range of possible mean values is 0 to 103.

Table 4.12 Descriptive Statistics for Academic Performance

	Group	Mean	Std. Deviation	N
Achievement Test Score	Treatment	75.9	14.1	34
	Control	81.8	11.7	24

The control group mean on the accounting test was higher than the treatment group mean. However, the difference was not statistically significant. Table 4.13 presents the source table from the statistical analysis.

Table 4.13 ANCOVA for Achievement Test Score

Dependent Variable: Achievement Test Score

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	581.8[b]	2	290.9	1.7	.200
Intercept	36707.4	1	36707.4	209.0	.000
TEACHER	78.7	1	78.7	.4	.506
GROUP	511.1	1	511.1	2.9	.094
Error	9658.9	55	175.6		
Total	366083.0	58			
Corrected Total	10240.8	57			

b. R Squared = .057 (Adjusted R Squared = .023)

Summary of Hypothesis Two Test

Group means for academic test scores of the treatment and control groups were different. However, the difference between groups was not statistically significant at an alpha level of .05. Students in the treatment group did not score significantly higher on the academic achievement test than students in the control group. Therefore, Hypothesis Two was not supported.

HYPOTHESIS THREE TESTED: METACOGNITIVE SKILL AND ACADEMIC ACHIEVEMENT

The third hypothesis of this study stated that increased metacognitive skill levels will be positively correlated with higher academic achievement scores. No significant difference was found in metacognitive skill

levels between the treatment and control groups. Accordingly, Hypothesis Three is moot.

POST HOC ANALYSIS OF EXPERIMENTAL DATA

All three hypotheses in this study were rejected. Data directly related to the hypotheses was used in tests of hypotheses. However, subject responses to the attitude scales from the MSLQ survey as well as other demographic information were gathered for possible post hoc analysis. The analysis of the additional data gathered in this study follows. The purpose of the analysis is to inform the failure to confirm the study hypotheses.

Student Motivation

In addition to the nine scales that measure metacognition, the MSLQ contains six separate scales which together measure student motivation. The motivation scales assess student value beliefs and learning goals, beliefs about skills to succeed, and test anxiety. The scales can be used in groups or individually (Pintrich, et al., 1991, p. 3). Motivation is an emotional or affective component and thereby affects a student's use of metacognitive skill and learning strategy (Huffman, et al., 1991). Initially the six scales for motivation were analyzed in total.

Analysis of All Motivation Scales Taken Together

ANCOVA was used to analyze the difference in means between the treatment group and the control group for the total of all motivation scales. The homogeneity of group regressions test was met. The independent variable was treatment condition. The dependent variable was the posttest MSLQ score for all

scales taken together. Concomitant variables were teacher and the pretest MSLQ score for all scales taken together (variable Preatot). Table 4.14 presents descriptive statistics for the treatment and control group dependent variables. The range of possible mean values is 31 to 217.

Table 4.14 Descriptive Statistics for All Motivation Scales

	Group	Mean	Std. Deviation	N
Total Motivation Scales	Treatment	151.4	23.0	34
	Control	170.6	16.8	24

The control group mean was higher for the posttest total motivation dependent variable. The difference in means between groups was statistically significant at the .05 level. Table 4.15 presents the source table from the analysis.

Table 4.15 ANCOVA for All Motivation Scales

Dependent Variable: Total Motivation Scales

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	17229.8[b]	3	5743.3	26.1	.000
Intercept	5569.7	1	5569.7	25.3	.000
Teacher	835.7	1	835.7	3.8	.057
Preatot	9406.0	1	9406.0	42.7	.000
Group	1675.9	1	1675.9	7.6	.008
Error	11881.6	54	5743.3	26.1	
Total	1502095.0	58	5569.7	25.3	
Corrected Total	29111.4	57	835.7	3.8	

b. R Squared = .592 (Adjusted R Squared = .569)

The individual motivation scales of the MSLQ were analyzed next. The six individual scales on the MSLQ which measure motivation are listed below:

1. Intrinsic Goal Orientation
2. Extrinsic Goal Orientation
3. Task Value
4. Control of Learning Beliefs
5. Self-Efficacy for Learning and Performance
6. Test Anxiety

The purpose of the analysis was to learn more about specific components of motivation that might explain the significant difference in total scores for motivation. The analysis found that the control group mean for control of learning beliefs was significantly higher than the treatment group mean. No significant difference in group means was found between treatment and the control groups on the remaining five scales. Table 4.16 presents descriptive statistics for each of the six motivation scales and for the total score for all motivations scales. Following is the analysis of the scale for control of learning beliefs. The analysis of the remaining five scales where no significant difference was found between group means is presented for reference in Appendix B.

Table 4.16 Descriptive Statistics for All Motivation Scales

	Group			
	Treatment		Control	
	Mean	Std Deviation	Mean	Std Deviation
Intrinsic motivation	19.3	3.56	20.9	3.22
Extrinsic motivation	19.9	3.97	23.0	3.99
Task value	31.4	5.82	35.0	4.56
Control of learning	20.6	4.45	23.6	3.50
Self-effficacy	39.1	8.00	47.2	15.46
Test anxiety	21.1	6.27	21.0	8.98
Total Motivation Scales	151.4	22.99	170.6	16.82

Analysis of the Control of Learning Beliefs Scale

ANCOVA was used to analyze the difference in means between the treatment group and the control group. The homogeneity of group regressions test was met. The independent variable was treatment condition. The dependent variable was the posttest MSLQ score for control of learning beliefs. Concomitant variables were teacher and the pretest MSLQ score for control of learning beliefs (variable Precntl). Table 4.17 presents descriptive statistics for the treatment and control group dependent variables. The range of possible mean values is 4 to 28.

Table 4.17 Descriptive Statistics for Control of Learning Beliefs

	Group	Mean	Std. Deviation	N
Control of learning beliefs	Treatment	20.6	4.4	34
	Control	23.6	3.5	24

The control group mean was higher for the posttest control of learning beliefs dependent variable. The difference in means between groups was significant at an alpha level of .05. Table 4.18 presents the source table from the analysis.

Table 4.18 ANCOVA for Control of Learning Beliefs

Dependent Variable: Control of learning beliefs

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	596.1[b]	3	198.7	22.8	.000
Intercept	366.0	1	366.0	42.0	.000
Teacher	77.9	1	77.9	8.9	.004
Precntl	251.7	1	251.7	28.9	.000
Group	57.0	1	57.0	6.5	.013
Error	470.2	54	8.7		
Total	28700.0	58			
Corrected Total	1066.3	57			

b. R Squared = .559 (Adjusted R Squared = .535)

Summary of Post Hoc Analysis

Motivation is an affective component of students' use of metacognitive skill and learning strategy. The motivation of the study sample group was examined to learn if motivational differences between the treatment and control groups may have affected the results of the study. Group means of the treatment and control groups were different on all motivation scales taken together and for each motivation scale individually. Except for the control of learning beliefs scale, all differences on motivation scales between groups were not statistically significant at an alpha level of .05. The control group reported significantly higher scores than the treatment group on the control of learning beliefs scale.

ANALYSIS OF MISSING DATA

A total of 23 students who returned completed pretest MSLQ forms did not return posttest MSLQ forms. Data analysis in this study was limited to data attributable to paired MSLQ forms, or data from students who returned both pretest and posttest MSLQ forms. Possibly data from students who did not return posttest MSLQ forms may be different compared to paired cases. If so, the differences may affect the interpretation of data from paired cases. Paired versus unpaired cases were examined to determine if significant differences could be found.

The pretest MSLQ scores from paired forms were compared to pretest MSLQ scores from unpaired forms. Mean scores were tested for total motivation and total learning strategy scales. Also, mean scores for scale of the MSLQ were tested. Group means for paired and unpaired cases were different on all scales

tested. Analysis of variance (ANOVA) was used to test the difference in group means. The independent variable was the group identity, either paired or unpaired. The dependent variables were the pretest mean scores on the MSLQ. Except for between groups differences on one motivation scale and one learning strategy scale, no significant differences between groups were found. Descriptive statistics for paired and unpaired cases are presented for reference in Appendix C.

Significant Difference in Extrinsic Goal Orientation Motivation Scale

The group mean for unpaired cases was higher than the mean for paired cases on the extrinsic goal orientation motivation scale. Table 4.19 presents descriptive statistics for the paired and unpaired dependent variables of pretest extrinsic goal orientation.

Table 4.19 Descriptive Statistics for Extrinsic Goal Orientation

	Group	Mean	Std. Deviation	N
Pretest Extrinsic Goal Orientation	Paired Cases	21.3	3.9	58
	Unpaired Cases	23.2	3.3	23

The difference in between group means was significant at an alpha level of .05. Table 4.20 presents the source table from the statistical analysis.

Table 4.20 ANOVA for Pretest Extrinsic Goal Orientation

		Sum of Squares	df	Mean Square	F	Sig.
Pretest Extrinsic Goal Orientation	Between Groups	58.3	1	58.3	4.141	.045
	Within Groups	1111.3	79	14.1		
	Total	1169.6	80			

Significant Difference in Effort Regulation Learning Strategy Scale

The group mean for paired cases was higher than the mean for unpaired cases on the effort regulation learning strategy scale. Table 4.21 presents descriptive statistics for the paired and unpaired dependent variables of pretest effort regulation.

Table 4.21 Descriptive Statistics for Effort Regulation Learning Strategy Scale

	Group	Mean	Std. Deviation	N
Pretest Effort Regulation	Paired Cases	20.9	4.6	58
	Unpaired Cases	18.7	3.0	23

The difference in between group means was significant at an alpha level of .05. Table 4.22 presents the source table from the statistical analysis.

Table 4.22 ANOVA for Effort Regulation Learning Strategy Scale

		Sum of Squares	df	Mean Square	F	Sig.
Pretest Effort Regulation	Between Groups	77.9	1	77.9	4.398	.039
	Within Groups	1399.0	79	17.7		
	Total	1476.9	80			

Summary of Missing Data Analysis

Two significant differences were found in between group means for paired cases compared to unpaired cases. First, extrinsic goal orientation scale mean scores were significantly higher for unpaired cases than for paired cases. Yet within the paired cases, no significant difference was found on the extrinsic goal orientation scale between treatment and control groups.

Second, effort regulation scale mean scores were significantly higher for paired cases than for unpaired cases. Yet again, within the paired cases no significant difference was found on the effort regulation scale between the treatment and control groups.

The presence of significant differences between the means of paired and unpaired cases on two scales is interesting but not illuminating. No conclusion is possible as to the effect of missing data upon the results of this study.

SUMMARY OF CHAPTER FOUR

Hypothesis One stated that students in the treatment group would report significantly higher scores on the MSLQ learning strategies scales than students

in the control group. Only two significant differences were found between group means on learning strategy. For effort regulation, the control group mean scores were significantly higher than the treatment group mean scores. For peer learning, the treatment group mean scores were significantly higher than the control group mean scores strategies. However, the presence of a single significant difference on a resource management scale was deemed inadequate support for Hypothesis One. Hypothesis One was rejected.

Hypothesis Two stated that students in the treatment group would score higher on an academic achievement test than students in the control group. The mean academic test score for the control group was higher than for the treatment group. However, the difference between group means was not significant. Hypothesis Two was not supported.

Hypothesis Three stated that increased metacognitive skills would be positively correlated with increased academic achievement among students who used the modified software. No significant increase in metacognitive skill or academic achievement was found. Hypothesis Three was moot.

Mean scores for motivation scales from the MSLQ were tested to determine if the control group mean scores were higher than the treatment group. No differences between group means were significant except for the group means for the control of learning beliefs. The control group mean for control of learning beliefs was significantly higher than the treatment group mean.

Pretest data from unpaired questionnaires was compared to data from paired questionnaires. The purpose of the comparison was to learn if students

who dropped out of the study were different from students who completed the study, and if so, whether the differences might have affected the results of this study. Differences between group means were significant for pretest MSLQ responses on two scales. The mean score for pretest extrinsic goal orientation was significantly higher for the group of unpaired questionnaires. Conversely, the mean score for pretest effort regulation was significantly higher for the group of paired questionnaires. However, no conclusion was possible as to the effect of missing data on the results of this study.

Chapter 5: Discussion

INTRODUCTION

This study investigated the effects of computer-based cognitive and metacognitive skills training upon academic performance in accounting. The research setting was a community college in a large southwestern city. The study was conducted during the initial five weeks of a 15 week financial accounting course. Financial accounting is the first course in accounting for business students. Included in the four credit hour course is a weekly 50-minute computer laboratory component. In the first five weeks of the course, students are expected to be able to identify types of accounts, record transactions, record adjusting entries as appropriate, prepare financial statements, and complete the accounting cycle. Students use special software during the computer lab sessions to solve problems assigned from the course textbook.

The accounting computer lab presented an opportunity to implement computer-based cognitive and metacognitive skill training. For this study, the lab software was modified to include the use of learning strategies and cues to improve metacognitive skill. The learning strategies included a type two frame, a cognitive map, and an image. Students in four sections of the financial accounting course voluntarily participated in the study. Two of the four sections were chosen randomly to receive the modified computer software and thereby became the treatment groups. The other two sections received the unmodified

software and were the control groups. Two instructors each taught two of the four sections. Each instructor taught one treatment group and one control group.

The research in this study took place in an actual classroom setting. Accordingly, the results of this study are subject to uncontrollable variance. To minimize within group differences to the extent possible, the experimental design used in this study attempted to control for known nuisance variables such as teacher and student differences. Analysis of covariance was used to control for initial differences in metacognitive skill among groups and differences in instructor influence across groups.

Three research questions were explored in this study. The first question was whether students who use software modified to include metacognitive skill training will significantly increase metacognitive skill levels compared to students who do not use modified software. Changes in cognitive and metacognitive skills were measured by the Motivated Learning Strategies Questionnaire (MSLQ) developed by Pintrich, et al. (1991). The second research question was whether students who use software modified to increase metacognitive skill levels will achieve significantly higher performance on an accounting test than students who do not use modified software. The third research question was whether the increase in metacognitive skill levels will be positively correlated with the increase in academic performance among students using software modified to include metacognitive skill training.

HYPOTHESIS ONE: DISCUSSION OF RESULTS

Hypothesis One: Students who use software modified to include metacognitive skill training will report significantly higher scores on the MSLQ measurement of metacognition and learning strategy use than reported by students who do not use the modified software.

Hypothesis One states that the students using modified software would improve cognitive and metacognitive skills significantly more than students not using modified software. The broad intent of the modifications was to heighten learner awareness of learning objectives, provide strategies to use to achieve learning objectives, and to heighten learner awareness of success in achievement of learning objectives while simultaneously promoting learner reflection upon the learning process. Specifically, the modifications made were to:

1. Increase learner awareness of the learning objective,
2. Provide the learner with learning strategies to accomplish the learning objective,
3. Provide scaffolded instruction during problem solving,
4. Increase learner awareness of success in meeting learning objectives,
5. Confirm that the learner understood how to use the learning strategy,
6. Determine whether the learner would use the learning strategy in the future, and
7. Determine whether the learner enjoyed using the learning strategy to solve the problem.

REVIEW OF THE MODIFIED SOFTWARE

The modified software required an initial response from the learner before the learner was allowed to work on an accounting problem. The learner first entered his or her learning objective and then confirmed whether the entry was similar to the learning objective specified for the problem by the software. The requirement to enter a learning objective should increase the learner's metacognitive regulation skill of planning.

The software was modified to include several learning strategy tools for use in solving problems. The tools were an image, a cognitive map, and a type two frame. The learner could access the image and map tools by clicking on a button. The map intended to aid the learner in visualizing the relationship of the elements of the accounting equation, and the image intended to aid learner recall of the relationship of debits and credits. The type two frame learning strategy was embedded in the presentation of the accounting problem. The frame intended to increase the learner's metacognitive skills of planning, monitoring, control and evaluation.

As the learner worked the first two steps of each accounting problem, a hint was displayed to remind the learner of the questions the learner must answer in order to solve the problem. The questions to be answered were "What happened?" and "What changed?" The hint display intended to increase the learner's metacognitive regulation skills of monitoring, control, and remediation.

The original software contained a feedback feature that provided learners with hints to the solution of each problem step. For the modified version of the

software, the hint function was supplemented to include answers to the questions "What happened?" and "What changed?" Presenting hints as the answers to reflective questions should increase the learner's awareness of cognition and increase the learner's metacognitive regulation skills of monitoring, control, and remediation.

In the modified software, the learner was required to respond to four questions when saving the solution to a problem. In order, the four exit questions were: (a) In general, how well do you think you learned the material covered by this problem, (b) Did you understand how to use the learning strategy to meet your learning goal, (c) Will you use the strategy in the future on your own, and (d) Did you enjoy using the strategy? The exit questions should increase the learner's metacognitive skills of awareness of cognition and regulation skills of planning and evaluation.

Evaluation of Modifications to Software

Prior to implementation, the treatment group software was tested to determine if the modifications could change metacognitive and cognitive skill levels. First, all problem steps of modified problem were completed to determine that all program functions were operational and that all problem-specific hints were accurate. Next, an independent evaluation of the modified software was made by experienced educators to confirm the face validity of the software. The modified software appeared to be capable of achieving the intended purpose of increasing metacognitive and cognitive skills among accounting students. Lastly,

a pilot study was conducted to test the effect of the modified software upon metacognitive and cognitive skill levels.

The results of the pilot test were very encouraging. The quantitative analysis of pretest and posttest MSLQ data from the volunteers showed a significant increase in metacognitive skill levels. Qualitative responses to the software were encouraging. Volunteers made many very positive comments while using the software such as "This is cool!" and "This is fun!" and "This makes learning easy!" Overall the motivation of volunteers seemed very positive toward use of the software to learn accounting.

The purpose of the modified software evaluation was to determine if the modifications made to the software could accomplish increasing metacognitive and cognitive skill levels. The modified software was judged to have high face validity. The pilot test results showed significant changes in metacognitive and cognitive skill levels. Qualitative data was positive and encouraging. Based upon overall positive evaluation results, the modified software was used to test the hypotheses in this study.

Hypothesis One Not Supported

Hypothesis One stated that students using the modified accounting software would score significantly higher on the MSLQ than students using the unmodified software. The results of this study could not support Hypothesis One. With one exception, students using the modified software did not show significant increases on the MSLQ compared to students using the unmodified software. The scale measuring the use of peer groups to assist in learning objectives

achievement was the only instance where the treatment group reported significantly higher scores than the control group. The use of peers to assist in achieving learning objectives is among the group of strategies on the MSLQ which collectively measure the management of learning resources rather than cognition and metacognition. No significant differences were found among the scales measuring cognitive and metacognitive strategies. The significant difference on the peer learning scale alone was deemed inadequate to support Hypothesis One.

Potential Factors in the Failure to Confirm Hypothesis One

Several factors may have influenced the results in this study. A possible factor in the failure to find a difference between the control and treatment groups is the relatively short duration of the treatment intervention. The time interval allowed for treatment was limited by the research setting. The treatment group used the modified software for 50 minutes once a week for five weeks. No additional instructional time during the week was available for students to use the modified software. The number of weeks available for students to use the software was limited by the predetermined date of the accounting test covering the material. The date for the accounting test was fixed by the semester calendar.

Previous research has demonstrated that metacognitive and cognitive skill levels can change with training and time. A study by Paris and Oka (1986) reported increased metacognitive skill levels among subjects after 30 to 40 hours of special instruction in strategies and strategy use over two semesters. Brown, Palincsar, and Armbruster (1984) also reported increased metacognitive skill

levels after substantial time was spent on cognitive strategy training and practice in three separate studies. The first study by Brown, Palincsar, and Armbruster (1984) was conducted over six months and provided subjects approximately 15 days of special instruction. The second and third studies conducted by Brown, Palincsar, and Armbruster (1984) delivered approximately 23 days of special instruction to the subjects over eight weeks. Kurtz and Borkowski (1984) reported increased metacognitive skill levels among subjects after weekly 25 minute sessions for 11 weeks.

Each of the above studies report substantially more time in delivery of the intervention treatment than was spent in this study. The time limitation in this study for delivery of the intervention was known at the outset. Nonetheless, the pilot test results gave reason to believe the intervention time might be adequate.

A second possible factor in the failure to find a difference between the control and treatment group is the unknown effect of using the unmodified original software. Both the modified and unmodified software are relatively similar, and each might contribute to changes in metacognitive and cognitive skills. The control group may have received metacognitive and cognitive skill benefits from the use of the unmodified software, although the unmodified software does not contain the design changes described above to enhance metacognition. Initially the unmodified software is more difficult to use than the modified software, as reported by the treatment group after the study was completed. The unmodified software's greater initial difficulty in use may promote a high level of engagement and reflection among users in order for users

to be successful in solving problems. If so, then the control group received benefits that may have diluted the effect of the treatment in this study.

A possible third factor in the failure to find a difference between the control and treatment group may be the timing of the administration of the MSLQ posttest. The pretest MSLQ was given to volunteer students at the start of the fall semester when student enthusiasm and expectations were unaffected by experience of the semester to come. When the posttest MSLQ was administered, volunteer students had experienced the accounting examination and six weeks of the semester. No other administration time was possible. Responses on the posttest MSLQ may have been influenced by students' experience with accounting subject matter, or the students' experience on the examination. In short, students may not have given full attention to the posttest MSLQ due to distraction from outside influences such as academic demands in other courses, job demands, or general concern about academic performance.

HYPOTHESIS TWO: DISCUSSION OF RESULTS

Hypothesis Two: Students who use software modified to include metacognitive skill training will obtain significantly higher scores on an academic achievement test than students who do not use the modified software.

Hypothesis Two stated that students using the modified software would achieve higher scores than control group students on an accounting achievement test. The test was developed jointly by the two instructors in this study and given to all students. Acceptance of Hypothesis Two was contingent upon acceptance of Hypothesis One.

Hypothesis Two Not Supported

Hypothesis Two stated that students using the modified software would achieve significantly higher scores on an accounting test than students in the control group. The results of this study could not support Hypothesis Two. Students using the modified software did not score significantly higher on the accounting test than students using the unmodified software.

Potential Factors in the Failure to Support Hypothesis Two

A possible factor in the failure to find a significant difference in academic performance between treatment and control groups is the lack of a significant difference in metacognitive skill between groups. Differences in metacognitive skills contribute to differences in academic performance, according to Brown and Palincsar (1982), Brown, Palincsar, and Armbruster (1984), Derry and Murphy (1986), Paris and Oka (1986), Redding (1990), and Wong and Jones (1982). No significant difference in metacognitive skill between groups was found in this study. Therefore, no significant difference in academic performance between groups would be predicted.

Discussion of the Results of Testing Hypothesis Three

Hypothesis Three: Increased metacognitive skill levels will be positively correlated with higher academic achievement among students who use software modified to include metacognitive skill training.

In this study, no significant differences were found in either metacognitive skill or academic performance. The confirmation of Hypothesis Three is moot.

DISCUSSION OF THE MSLQ SCALES FOR MOTIVATION

Motivation is an affective component of learning and use of learning strategies (Huffman, et al., 1991). The MSLQ contains 31 questions grouped on six scales which measure motivation. A Post Hoc analysis was performed to determine if any significant differences in motivation could be found between the treatment and control groups.

The posttest motivation of the control group was found to be significantly higher than the treatment group, as measured by all six of the motivation scales of the MSLQ taken together. Individual analysis of the six motivation scales found that posttest scores for the Control of Learning Belief scale were significantly higher for the control group than the treatment group. No significant differences were found between the treatment and control groups on the remaining five motivation scales.

The Control of Learning Belief scale measures the degree to which a learner believes a learning outcome is contingent upon his or her own effort, apart from external factors such as the teacher or other students. Students are more likely to use cognitive and metacognitive strategies when students believe the effort required to use the strategy will make a difference in learning success (Pintrich, et al., 1991, p. 12). The control group reported a greater belief that learning success resulted from the effort made to learn by the learner. No intentional effort in this study was made to increase student attribution of success to effort. The difference between groups in this study may be the result of uncontrollable variance.

The control group also had significantly higher overall levels of motivation than the treatment group. The difference in overall motivation levels between groups may be the result of the difference in control of learning beliefs between groups, or instead the difference may be due to uncontrollable variance between groups. Nonetheless, the greater degree of overall motivation and the greater attribution of learning success to effort by the control group may contribute to the lack of a significant difference in metacognitive skill levels between the treatment and control groups.

TOP TEST SCORERS IN THE TREATMENT AND CONTROL GROUPS

The differences and similarities of students in the top quartile of test scores in both the treatment and control groups were examined to better understand the differences and similarities of the treatment and control groups in total. Both the top academic students in the treatment and control groups reported taking a total course load this fall semester of between three and four courses, and both groups plan to take between one and two more courses in accounting. The mean high school graduation year for the top academic students in the treatment group was 1994, and 1988 for the top academic control group students. Compared to the control group, the top 25% academic students in the treatment group spent more time each week at work (means of 26.1 hours versus 12.7 hours) and less time each week studying for financial accounting (4.2 hours versus 7.3 hours). Table 5.1 presents descriptive statistics for the variables of course load, graduation year, hours spent each studying for financial accounting,

hours spent each week at work, and the number of additional accounting courses planned.

Table 5.1 Descriptive Statistics for the Top 25% Academic Test Scores

	Group			
	Treatment Group		Control Group	
	Mean	Std Deviation	Mean	Std Deviation
Number of Courses Enrolled	3.7	.9	3.3	1.6
High School Graduation Year	93.8	3.0	87.5	9.4
Additional Accounting Courses Planned	1.9	.8	1.5	.8
Hours per Week Studying for this Course	4.2	2.9	7.3	2.5
Hours Spent at Work	26.1	14.1	12.7	14.2

None of the differences between the top academic students in the treatment and control groups seems striking except the difference in the mean time spent studying for financial accounting. The difference in group means was significant at an alpha level of .05. The greater amount of time spent studying by the best academic students in the control group may explain the higher mean of test scores achieved by the control group compared to the treatment group.

Analysis of Paired versus Unpaired Data on Pretest Measures

A total of 81 students responded to the pretest MSLQ form and 58 students responded to the posttest MSLQ form. This study analyzed results using only the data gathered from matched pretest and posttest forms, or paired responses. A total of 23 pretest forms had no matching posttest form. Therefore, the data from the 23 unpaired forms was not used for analysis of results in this study.

The unpaired pretest responses were compared to paired pretest responses. The intent was to determine whether study results might have been different if the 23 students who dropped out instead had remained in the study. Analysis of variance (ANOVA) was used to analyze the difference in means between the paired and unpaired responses to the pretest MSLQ form. The independent variable was group membership, either paired or unpaired. The dependent variable was the group mean pretest MSLQ score. The unpaired responses differed significantly from the paired responses on two of the 15 MSLQ scales. Descriptive statistics for the paired versus unpaired MSLQ responses are presented in Appendix C.

For the motivation scale of Extrinsic Goal Orientation, the unpaired responses group mean was significantly higher than the paired responses group mean. Extrinsic goal orientation is the "degree to which the student perceives herself to be participating in a task for reasons such as grades, rewards, performance, evaluation by other, and competition" instead of reasons related to the task itself (Pintrich, et al., 1991, p. 10). By contrast, the group of 58 students

who remained in the study were less motivated by reasons unrelated to the learning task.

For the learning strategy scale of Effort Regulation, the paired responses group mean was significantly higher than the unpaired responses group mean. Effort regulation relates to students' ability to "control their effort and attention in the face of distractions and uninteresting tasks" (Pintrich, et al., 1991, p. 27). Effort management "also regulates the continued use of learning strategies" (Pintrich, et al. 1991, p. 27). Accordingly, the 58 students who remained in the study were more likely to use learning strategies than the 23 students who dropped out.

A larger sample size would increase the statistical power of this study. The loss of 23 respondents might have changed some of the study results. However, given the results of the analysis of paired and unpaired cases, the more probable conclusion seems to be that the loss of the 23 respondents did not significantly alter the study outcome.

Analysis of Final Results for the Semester

Final semester grades were obtained for students in the study who completed the financial accounting course. The purpose was to discover if the students in the treatment group received some latent academic benefit not apparent during the study period but which surfaced later in the academic year. Only final letter grades were available to measure academic performance, not final numerical scores. A letter grade of A was given a value of 4, a letter grade of B was given a value of 3, a letter grade of C was given a value of 2, a letter

grade of D was given a value of 1, and a letter grade of F was given a value of 0. ANCOVA was used to analyze the difference in means between the treatment group and the control group. The homogeneity of group regressions test was met. The independent variable was treatment condition. The dependent variable was the final grade for the semester. The concomitant variable was the teacher. Table 5.2 presents descriptive statistics for the treatment and control group final grade in financial accounting. The range of possible values is 0 to 4.

Table 5.2 Descriptive Statistics for Final Grade

	Group	Mean	Std. Deviation	N
Grade	Treatment	2.2	1.0	37
	Control	2.7	1.2	28

The control group mean for final grade was higher than the treatment group mean. However, the difference was not statistically significant at an alpha level of .05. Table 5.3 presents the source table from the statistical analysis.

Table 5.3 ANCOVA for Final Grade

Dependent Variable: Grade

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	4.5[b]	2	2.3	2.0	.147
Intercept	40.8	1	40.8	35.5	.000
TEACHER	.2	1	.2	.1	.719
GROUP	4.5	1	4.5	3.9	.052
Error	71.2	62	1.1		
Total	455.0	65			
Corrected Total	75.8	64			

b. R Squared = .060 (Adjusted R Squared = .030)

RECOMMENDATIONS FOR FUTURE RESEARCH

Reflection upon the results of this study bring to mind several changes in the experimental design that may increase the possibility of confirming the original study hypotheses. The changes may be grouped into two general categories: changes in the conduct of the study; and further modifications to the software that might strengthen the effect of the treatment.

Changes to the Conduct of Future Studies to Achieve Significant Results

The initial software training sessions might place more emphasis on describing appropriate learning strategies, describing how to use strategies, and describing the benefits obtained from strategy use. Greater emphasis in the software on strategy use and benefit, detached from the instructional content, may increase strategy use and thereby strengthen the treatment effect (Derry and

Murphy, 1986). In the present study, learners received training in using learning strategies within the context of learning to use the software. Separate emphasis on the software's strategies, apart from the software, may increase learner awareness of the strategies and the use of strategies. Possibly learners would then better understand how to apply the strategies away from the computer environment.

Additional time might be spent in future research to deliver the treatment. A longer period of time during which learners practiced the use of strategies and benefited from strategy use might strengthen changes caused by the treatment. The present study was limited to a period of five weeks. A period of 15 weeks may be needed to increase the chance to find a significant difference by allowing more time for change to occur among learners.

Future research might explore the effect of the modified software, with changes as described above, in an instructional environment which placed less emphasis on classroom instruction. In the present study, learners were in the accounting lab only a third of the time spent in the classroom. The effect of classroom instruction may have diluted the treatment effect of the software in the present study. Less classroom instruction offset by more computer-based instruction may strengthen the effect of the computer-based instruction without a decline in academic performance.

Modifications to Strengthen the Treatment Effect of the Software

Prompts added to the software might make the learning strategy more explicit to the learner. Prompts might take the form of visual cues such as

blinking or moving screen objects, or possibly flashing areas of the screen with explanatory text messages indicating the next step to take. The learner might be required to use a strategy repeatedly in order that strategy use might become more automatic and to reinforce both strategy use and the benefit. Such modifications would be a form of guided practice. Only a few problems in each instructional content area would need to be modified. After practice with problems containing the additional prompts, the learner then might be required to solve similar problems successfully without supporting prompts. Without supporting prompts the learner would independently initiate strategy use and move from a passive to an active role. These modifications would serve to scaffold training to move the learner toward automatic and unconscious application of learning strategies.

The exit questions might be changed to require the learner to enter a text response to each question. In the present study the learner was required to click a button to respond to the exit questions. After a few experiences in answering the exit questions, learners may not have carefully considered the responses and instead simply clicked as quickly as possible to be allowed to exit. A requirement to enter a text response may cause the learner to reflect upon his or her answer more carefully. Reflection that is more careful may increase metacognitive skill and awareness.

CONCLUSION

This study examined whether inclusion of three learning strategy tools in accounting software might increase levels of metacognitive skill, whether use of the learning strategy tools would increase academic performance, and whether

increased metacognitive skill levels would be correlated with increased academic performance among beginning accounting students. The modified software was designed to help the learner become aware of learning strategy use and benefits of learning strategy use. However, this study failed to discover significant differences between learners who were provided three learning strategy tools compared to learners who were not. Additional research is necessary to identify what means and methods will significantly increase the metacognitive skills of accounting students.

Appendix A Analysis of Learning Strategy Scales

ANALYSIS OF THE REHEARSAL LEARNING STRATEGY SCALE

ANCOVA was used initially to analyze the difference in means between the treatment group and the control group. However, the homogeneity of group regressions test was not met. Accordingly, analysis of variance (ANOVA) was used to test the difference in group means. The independent variable was treatment condition. The dependent variable was the posttest MSLQ score for the rehearsal learning strategy scale. Table A.1 presents descriptive statistics for the treatment and control group dependent variables. The range of possible mean values is 4 to 28.

Table A.1 Descriptive Statistics for Rehearsal Strategies

	Group	Mean	Std. Deviation	N
Rehearsal strategies	Treatment	17.6	4.2	34
	Control	18.5	5.0	24

The control group mean was higher for the posttest rehearsal strategies dependent variable. However, the difference in means between groups was not statistically significant. Table A.2 presents the source table from the statistical analysis.

Table A.2 ANOVA for Rehearsal Strategies

		Sum of Squares	df	Mean Square	F	Sig.
Rehearsal strategies	Between Groups	9.9	1	9.9	.486	.489
	Within Groups	1146.0	56	20.5		
	Total	1155.9	57			

ANALYSIS OF THE ELABORATION LEARNING STRATEGY SCALE

ANCOVA was used to analyze the difference in means between the treatment group and the control group. The homogeneity of group regressions test was met. The independent variable was treatment condition. The dependent variable was the posttest MSLQ score for the elaboration learning strategy scale. Concomitant variables were teacher and the pretest MSLQ score for the elaboration learning strategy scale (variable Preelab). Table A.3 presents descriptive statistics for the treatment and control group dependent variables. The range of possible mean values is 6 to 42.

Table A.3 Descriptive Statistics for Elaboration Strategies

	Group	Mean	Std. Deviation	N
Elaboration Strategies	Treatment	25.6	6.7	34
	Control	27.5	6.6	24

The control group mean was higher for the posttest elaboration strategies dependent variable. The difference in means between groups was not statistically significant. Table A.4 presents the source table from the statistical analysis.

Table A.4 ANCOVA for Elaboration Strategies

Dependent Variable: Elaboration Strategies

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	1154.3[b]	3	384.8	15.0	.000
Intercept	32.3	1	32.3	1.3	.266
Teacher	44.0	1	44.0	1.7	.195
Preelab	1101.2	1	1101.2	43.0	.000
Group	.5	1	.5	.0	.888
Error	1381.6	54	25.6		
Total	42949.0	58			
Corrected Total	2535.9	57			

b. R Squared = .455 (Adjusted R Squared = .425)

ANALYSIS OF THE ORGANIZATION LEARNING STRATEGY SCALE

ANCOVA was used to analyze the difference in means between the treatment group and the control group. The homogeneity of group regressions test was met. The independent variable was treatment condition. The dependent variable was the posttest MSLQ score for the organization learning strategy scale. Concomitant variables were teacher and the pretest MSLQ score for the organization learning strategy scale (variable Preorg). Table A.5 presents descriptive statistics for the treatment and control group dependent variables. The range of possible mean values is 4 to 28.

Table A.5 Descriptive Statistics for Organization Strategies

	Group	Mean	Std. Deviation	N
Organization Strategies	Treatment	15.1	4.2	34
	Control	17.1	4.9	24

The control group mean was higher for the posttest organization strategies dependent variable. However, the difference in means between groups was not significant. Table A.6 presents the source table from the statistical analysis.

Table A.6 ANCOVA for Organization Strategies

Dependent Variable: Organization Strategies

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	528.1[b]	3	176.0	14.2	.000
Intercept	82.8	1	82.8	6.7	.012
Teacher	20.7	1	20.7	1.7	.201
Preorg	435.3	1	435.3	35.2	.000
Group	2.1	1	2.1	.2	.683
Error	667.8	54	12.4		
Total	15980.0	58			
Corrected Total	1195.9	57			

b. R Squared = .442 (Adjusted R Squared = .411)

ANALYSIS OF THE CRITICAL THINKING LEARNING STRATEGY SCALE

ANCOVA was used to analyze the difference in means between the treatment group and the control group. The homogeneity of group regressions test was met. The independent variable was treatment condition. The dependent

variable was the posttest MSLQ score for the critical thinking learning strategy scale. Concomitant variables were teacher and the pretest MSLQ score for the critical thinking learning strategy scale (variable Precrit). Table A.7 presents descriptive statistics for the treatment and control group dependent variables. The range of possible mean values is 5 to 35.

Table A.7 Descriptive Statistics for Critical Thinking Strategies

	Group	Mean	Std. Deviation	N
Critical thinking strategies	Treatment	19.8	5.3	34
	Control	21.2	6.4	24

The control group mean was higher for the posttest critical thinking strategies dependent variable. However, the difference in means between groups was not significant. Table A.8 presents the source table from the statistical analysis.

Table A.8 ANCOVA for Critical Thinking Strategies

Dependent Variable: Critical thinking strategies

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	1146.7[b]	3	382.2	28.2	.000
Intercept	20.3	1	20.3	1.5	.226
Teacher	9.0	1	9.0	.7	.418
Precrit	1114.7	1	1114.7	82.4	.000
Group	6.8	1	6.8	.5	.482
Error	730.7	54	13.5		
Total	25925.0	58			
Corrected Total	1877.4	57			

b. R Squared = .611 (Adjusted R Squared = .589)

ANALYSIS OF THE METACOGNITIVE SELF-REGULATION STRATEGY SCALE

ANCOVA was used to analyze the difference in means between the treatment group and the control group. The homogeneity of group regressions test was met. The independent variable was treatment condition. The dependent variable was the posttest MSLQ score for the metacognitive self-regulation learning strategy scale. Concomitant variables were teacher and the pretest MSLQ score for the metacognitive self-regulation strategy scale (variable Premcog). Table A.9 presents descriptive statistics for the treatment and control group dependent variables. The range of possible mean values is 12 to 84.

Table A.9 Descriptive Statistics for Metacognitive Self-Regulation Strategies

	Group	Mean	Std. Deviation	N
Metacognitive Self-Regulation Strategies	Treatment	51.7	8.5	34
	Control	54.5	10.8	24

The control group mean was higher for the posttest metacognitive self-regulation strategies dependent variable. However, the difference in means between groups was not significant. Table A.10 presents the source table from the statistical analysis.

Table A.10 ANCOVA for Metacognitive Self-Regulation Strategies

Dependent Variable: Metacognitive Self-Regulation Strategies

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	3588.5[b]	3	1196.2	39.5	.000
Intercept	199.7	1	199.7	6.6	.013
Teacher	34.9	1	34.9	1.2	.288
Premcog	3467.4	1	3467.4	114.4	.000
Group	71.8	1	71.8	2.4	.130
Error	1636.4	54	30.3		
Total	167300.0	58			
Corrected Total	5224.9	57			

b. R Squared = .687 (Adjusted R Squared = .669)

ANALYSIS OF THE TIME AND STUDY ENVIRONMENT STRATEGY SCALE

ANCOVA was used to analyze the difference in means between the treatment group and the control group. The homogeneity of group regressions test was met. The independent variable was treatment condition. The dependent variable was the posttest MSLQ score for the time and study environment learning strategy scale. Concomitant variables were teacher and the pretest MSLQ score for the time and study environment strategy scale (variable Preenvi). Table A.11 presents descriptive statistics for the treatment and control group dependent variables. The range of possible mean values is 8 to 56.

Table A.11 Descriptive Statistics for Time and Study Environment Strategies

	Group	Mean	Std. Deviation	N
Time and study environment strategies	Treatment	37.4	8.1	34
	Control	41.0	9.9	24

The control group mean was higher for the posttest time and study environment strategies dependent variable. However, the difference in means between groups was not significant. Table A.12 presents the source table from the statistical analysis.

Table A.12 ANCOVA for Time and Study Environment Strategies

Dependent Variable: Time and study environment strategies

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	2968.0[b]	3	989.3	33.1	.000
Intercept	10.8	1	10.8	.4	.550
Teacher	52.5	1	52.5	1.8	.190
Preenvi	2549.4	1	2549.4	85.4	.000
Group	8.2	1	8.2	.3	.602
Error	1612.2	54	29.9		
Total	92253.0	58			
Corrected Total	4580.2	57			

b. R Squared = .648 (Adjusted R Squared = .628)

ANALYSIS OF THE HELP SEEKING STRATEGY SCALE

ANCOVA was used to analyze the difference in means between the treatment group and the control group. The homogeneity of group regressions test was met. The independent variable was treatment condition. The dependent variable was the posttest MSLQ score for the help seeking learning strategy scale. Concomitant variables were teacher and the pretest MSLQ score for the help seeking learning strategy scale (variable Prehelp). Table A.13 presents descriptive statistics for the treatment and control group dependent variables. The range of possible mean values is 4 to 28.

Table A.13 Descriptive Statistics for Help Seeking Strategies

	Group	Mean	Std. Deviation	N
Help seeking strategies	Treatment	15.4	4.8	34
	Control	16.3	6.2	24

The control group mean was higher for the posttest elaboration strategies dependent variable. The difference in means between groups was not statistically significant. Table A.14 presents the source table from the statistical analysis.

Table A.14 ANCOVA for Help Seeking Strategies

Dependent Variable: Help seeking strategies

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	768.7[b]	3	256.2	15.9	.000
Intercept	5.6	1	5.6	.3	.559
Teacher	101.4	1	101.4	6.3	.015
Prehelp	667.6	1	667.6	41.4	.000
Group	12.3	1	12.3	.8	.386
Error	871.4	54	16.1		
Total	16075.0	58			
Corrected Total	1640.1	57			

b. R Squared = .469 (Adjusted R Squared = .439)

Appendix B Analysis of Motivation Scales

ANALYSIS OF THE INTRINSIC GOAL ORIENTATION SCALE

ANCOVA was used to analyze the difference in means between the treatment group and the control group. The homogeneity of group regressions test was met. The independent variable was treatment condition. The dependent variable was the posttest MSLQ score for intrinsic goal orientation. Concomitant variables were teacher and the pretest MSLQ score for intrinsic goal orientation (variable Preintr). Table B.1 presents descriptive statistics for the treatment and control group dependent variables. The range of possible mean values is 4 to 28.

Table B.1 Descriptive Statistics for Intrinsic Goal Orientation Scale

	Group	Mean	Std. Deviation	N
Intrinsic goal orientation	Treatment	19.3	3.6	34
	Control	20.9	3.2	24

The control group mean was higher for the posttest intrinsic goal orientation dependent variable. However, the difference in means between groups was not significant. Table B.2 presents the source table from the analysis.

Table B.2 ANCOVA for Intrinsic Goal Orientation

Dependent Variable: Intrinsic goal orientation

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	359.1[b]	3	119.7	19.5	.000
Intercept	140.3	1	140.3	22.9	.000
Teacher	14.8	1	14.8	2.4	.126
Preintr	308.3	1	308.3	50.3	.000
Group	1.6	1	1.6	.3	.610
Error	330.9	54	6.1		
Total	23810.0	58			
Corrected Total	689.9	57			

b. R Squared = .520 (Adjusted R Squared = .494)

ANALYSIS OF THE EXTRINSIC GOAL ORIENTATION SCALE

ANCOVA was used to analyze the difference in means between the treatment group and the control group. The homogeneity of group regressions test was met. The independent variable was treatment condition. The dependent variable was the posttest MSLQ score for extrinsic goal orientation. Concomitant variables were teacher and the pretest MSLQ score for extrinsic goal orientation (variable Preextr). Table B.3 presents descriptive statistics for the treatment and control group dependent variables. The range of possible mean values is 4 to 28.

Table B.3 Descriptive Statistics for Extrinsic Goal Orientation

	Group	Mean	Std. Deviation	N
Extrinsic goal orientation	Treatment	19.9	4.0	34
	Control	23.0	4.0	24

The control group mean was higher for the posttest extrinsic goal orientation dependent variable. However, the difference in means between groups was not significant. Table B.4 presents the source table from the analysis.

Table B.4 ANCOVA for Extrinsic Goal Orientation

Dependent Variable: Extrinsic goal orientation

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	569.9[b]	3	190.0	22.5	.000
Intercept	83.4	1	83.4	9.9	.003
Teacher	32.3	1	32.3	3.8	.055
Preextr	385.7	1	385.7	45.7	.000
Group	14.5	1	14.5	1.7	.196
Error	455.7	54	8.4		
Total	26983.0	58			
Corrected Total	1025.6	57			

b. R Squared = .556 (Adjusted R Squared = .531)

ANALYSIS OF THE TASK VALUE SCALE

ANCOVA was used to analyze the difference in means between the treatment group and the control group. The homogeneity of group regressions test was met. The independent variable was treatment condition. The dependent

variable was the posttest MSLQ score for task value. Concomitant variables were teacher and the pretest MSLQ score for task value (variable Pretask). Table B5.6 presents descriptive statistics for the treatment and control group dependent variables. The range of possible mean values is 6 to 42.

Table B.5 Descriptive Statistics for Task Value

	Group	Mean	Std. Deviation	N
Task value	Treatment	31.4	5.8	34
	Control	35.0	4.6	24

The control group mean was higher for the posttest task value dependent variable. However, the difference in means between groups was not significant. Table B.6 presents the source table from the analysis.

Table B.6 ANCOVA for Task Value

Dependent Variable: Task value

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	1166.4[b]	3	388.8	34.5	.000
Intercept	145.7	1	145.7	12.9	.001
Teacher	3.7	1	3.7	.3	.569
Pretask	943.2	1	943.2	83.8	.000
Group	22.6	1	22.6	2.0	.163
Error	607.7	54	11.3		
Total	64475.0	58			
Corrected Total	1774.2	57			

b. R Squared = .657 (Adjusted R Squared = .638)

ANALYSIS OF THE SELF-EFFICACY FOR LEARNING AND PERFORMANCE SCALE

ANCOVA was used to analyze the difference in means between the treatment group and the control group. The homogeneity of group regressions test was met. The independent variable was treatment condition. The dependent variable was the posttest MSLQ score for self-efficacy for learning and performance. Concomitant variables were teacher and the pretest MSLQ score for self-efficacy for learning and performance (variable Preself). Table B.7 presents descriptive statistics for the treatment and control group dependent variables. The range of possible mean values is 8 to 56.

Table B.7 Descriptive Statistics for Self-Efficacy for Learning and Performance

	Group	Mean	Std. Deviation	N
Self-effficacy for learning and performance	Treatment	39.1	8.0	34
	Control	47.2	15.5	24

The control group mean was higher for the posttest self-efficacy for learning and performance dependent variable. However, the difference in means between groups was not significant. Table B.8 presents the source table from the analysis.

Table B.8 ANCOVA for Self-Efficacy for Learning and Performance

Dependent Variable: Self-effficacy for learning and performance

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	2934.5[b]	3	978.2	9.5	.000
Intercept	375.8	1	375.8	3.6	.062
Teacher	40.3	1	40.3	.4	.535
Preself	1632.8	1	1632.8	15.8	.000
Group	251.2	1	251.2	2.4	.125
Error	5577.9	54	103.3		
Total	113105.0	58			
Corrected Total	8512.4	57			

b. R Squared = .345 (Adjusted R Squared = .308)

ANALYSIS OF THE TEST ANXIETY SCALE

ANCOVA was used to analyze the difference in means between the treatment group and the control group. The homogeneity of group regressions test was not met. Accordingly, analysis of variance (ANOVA) was used to test the difference in means between groups. The independent variable was treatment condition. The dependent variable was the posttest MSLQ score for test anxiety. Table B.9 presents descriptive statistics for the treatment and control group dependent variables. The range of possible mean values is 5 to 35.

Table B.9 Descriptive Statistics for Test Anxiety

	Group	Mean	Std. Deviation	N
Test anxiety	Treatment	21.1	6.3	34
	Control	21.0	9.0	24

The control group mean was higher for the posttest test anxiety dependent variable. However, the difference in means between groups was not significant. Table B.10 presents the source table from the analysis.

Table B.10 ANOVA for Test Anxiety

		Sum of Squares	df	Mean Square	F	Sig.
Test anxiety	Between Groups	.5	1	.5	.009	.925
	Within Groups	3153.2	56	56.3		
	Total	3153.7	57			

Appendix C Paired vs. Unpaired MSLQ Responses

DESCRIPTIVE STATISTICS FOR PAIRED VERSUS UNPAIRED MSLQ RESPONSES

	Group			
	Paired Cases		Unpaired Cases	
	Mean	Std Deviation	Mean	Std Deviation
Pretest Intrinsic Goal Orientation	20.2	4.0	20.9	4.4
Pretest Extrinsic Goal Orientation	21.3	3.9	23.2	3.3
Pretest Task Value	33.7	6.3	34.1	5.0
Pretest Control of Learning Beliefs	21.7	5.1	23.0	2.8
Pretest Self-Efficacy for Learning and Performance	42.6	9.1	46.3	5.7
Pretest Test Anxiety	20.9	6.9	19.6	5.6
Pretest Rehearsal Learning Strategies	18.7	5.0	20.7	4.6
Pretest Elaboration Learning Strategies	27.6	6.4	30.0	5.1
Pretest Organization Learning Strategies	17.6	5.6	20.6	9.9
Pretest Critical Thinking Skills	21.1	6.0	22.2	3.7
Pretest Metacognitive Self-Regulation	53.2	11.2	57.3	9.1
Pretest Time and Study Environment	41.6	7.6	41.7	5.3
Pretest Effort Regulation	20.9	4.6	18.7	3.0
Pretest Peer Learning Strategies	9.6	4.0	10.0	2.9
Pretest Help Seeking Learning Strategies	16.5	5.2	16.7	3.9

Appendix D Learning Objectives and Hint Modifications

PROBLEM 3-24

Learning Objective: To correctly record journal entries

Problem Step	What happened was...	What changed was...
1	Share of ownership in the company were sold	Capital stock went up and cash went up
2	A note owed by the company was paid off together with interest	Notes payable went down, interest expense went up, and cash went down
3	Wages were paid	Wages expense went up and cash went down
4	Property taxes were paid	Property tax expense went up and cash went down
5	The company bought gear to sell later and will pay for it later	Inventory went up and accounts payable went up
6	Sold the gear for cash both now and later	Sales revenue went up, cash went up, and accounts receivable went up. Inventory went down and Cost of Goods Sold went up
7	Paid accounts payable	Accounts payable went down and cash went down
8	Customers paid some of what they owe the company	Accounts receivable went down and cash went up

PROBLEM 3-31

Learning Objective: To correctly record journal entries

Problem Step	What happened was...	What changed was...
1	Paid some payables	Accounts Payable went down and cash went down
2	Some customers paid what they owed	Cash went up and accounts receivable went down
3	Inventory was sold for some cash now and the rest to be paid later	Sales went up, cash went up and accounts receivable went up. Cost of goods sold went up and inventory went down.
4	Sold part of an asset for the same amount paid for it for some cash now and received a note for the balance	Cash went up, notes receivable went up and land went down
5	Bought inventory	Inventory went up and cash went down
6	Paid off part of the note payable	Note payable went down and cash went down
7	Sold some more ownership share in the company	Cash went up and capital stock went up
8	Inventory was sold for cash now	Sales went up and cash went up. Costs of goods sold went up and inventory went down.
9	Paid salaries with cash	Salary expense went up and cash went down
10	Paid rent with cash	Rent expense went up and cash went down
11	Bought furniture for cash	Furniture went up and cash went down

PROBLEM 4-42

Learning Objective: To determine the correct entry required to adjust account balances to the correct amount

Problem Step	What happened was...	What changed was...
1	The company received the benefit of employees working and owes them salaries	Salary expense went up and salaries payable went up
2	The company had the benefit of using borrowed money but there is a cost of having use of the money	Interest expense went up and interest payable went up
3	The company paid for six months rent in advance and now has used up one month	Rent expense went up and prepaid rent went down
4	Someone paid the company rent revenue in advance and now some of the rent has been earned	Unearned rent went down and rent revenue went up
5	The company paid for insurance in advance, and now some of the coverage has been used	Insurance expense went up and prepaid insurance went down
6	The company has earned interest income on a note receivable and should now recognize it	Interest income went up and interest receivable went up

PROBLEM 4-43

Learning Objective: To determine the correct entry required to adjust account balances to the correct amount

Problem Step	What happened was...	What changed was...
1	The company borrowed money from its bank – note (a)	Cash went up and notes payable (a) went up
2	Interest is due to be paid on loan (a)	Interest expense went up and cash went down
3	Interest is due to be paid on loan (a)	Interest expense went up and cash went down
4	Nothing happened – all costs of having borrowed the money are accounted for	Nothing changed since all costs associated with loan (a) are paid and current
5	The company borrowed money from its bank – note (b)	Cash went up and notes payable (b) went up
6	The company has had use of the loan money for two months and should record the cost of the money through December 31	Interest expense went up and interest payable went up
7	Nothing happened	Nothing changed
8	The company paid back loan (b) together with all the interest due to the bank	Interest expense went up, interest payable went down, notes payable (b) went down, and cash went down
9	The company paid the interest payment due on loan (a)	Interest expense went up and cash went down
10	The company paid off loan (a) together with the interest due on the loan	Interest expense went up, notes payable (a) and cash went down

PROBLEM 4-53

Learning Objective: To determine the correct entry required to adjust account balances to the correct amount and close the accounts

Problem Step	What happened was...	What changed was...
1	The company paid in advance for insurance and now some of the insurance has been used	Insurance expense goes up and prepaid insurance goes down
2	The company received rent income in advance from a tenant but at the end of the year all of the income has been earned	Nothing – the original entry is now correct at the end of the year
3	The company paid in advance for legal services but at the end of the year not all of the services have been used	Prepaid legal expense goes up and legal expense goes down
4	The company had to pay for property taxes a year in advance but some of the taxes are for next year	Prepaid property tax expense goes up and property tax expense goes down
5	The company paid loan interest in advance through the end of the year	Interest expense goes up and prepaid interest goes down

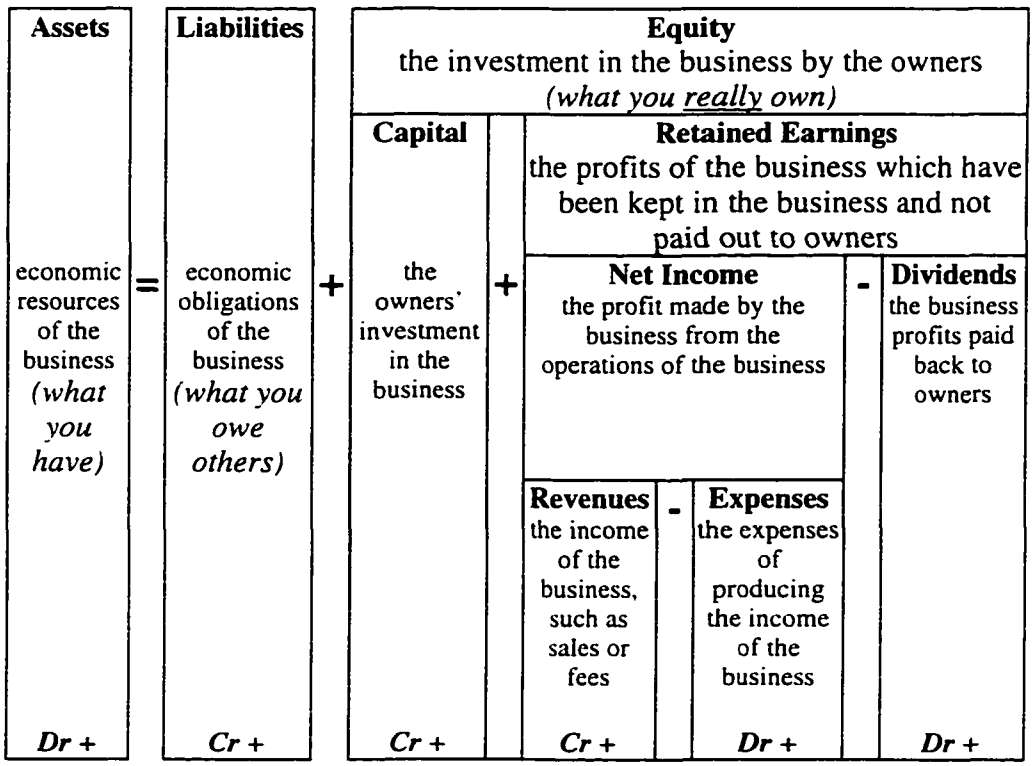
PROBLEM 4-BAC-2

Learning Objective: To analyze the transactions and adjust the accounts to accurately reflect what really happened

Problem Step	What happened was...	What changed was...
1	The company received an interest payment	Cash goes up and interest revenue goes up
2	The company earned commissions, received most of them in cash, and is still owed some commissions at year end	Cash goes up, commissions receivable goes up, and commissions revenue goes up
3	The company bought supplies during the year and used up the amount bought and also some of the beginning balance	Supplies expense goes up, supplies on hand and cash both go down
4	The company paid 18 months of rent in advance but has used up only 12	Rent expense goes up and prepaid rent goes down
5	The company paid for utilities during the year	Utility expense goes up and cash goes down
6	The company paid for miscellaneous expenses and also reduced accounts payable during the year	Accounts payable goes down, miscellaneous expense goes up, and cash goes down
7	The company paid salaries and wages during the year	Salary and wage expense goes up and cash goes down

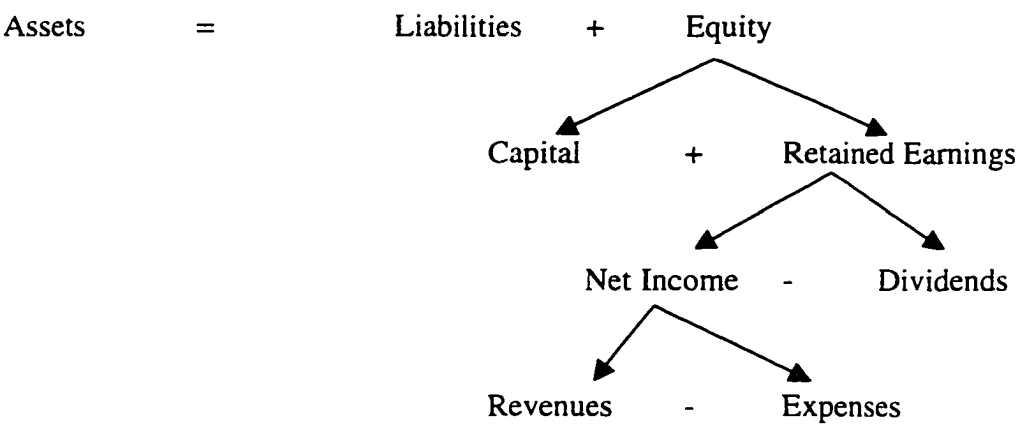
Appendix E Type Two Frame

TYPE TWO FRAME



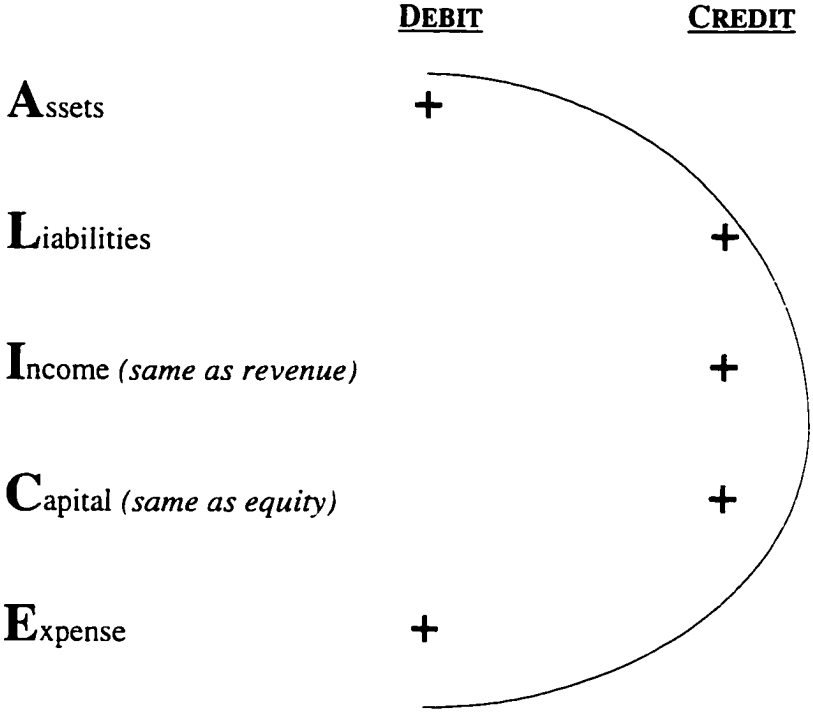
Appendix F Concept Map

COGNITIVE MAP: THE ACCOUNTING EQUATION FULLY EXPANDED



Appendix G ALICE IMAGE

ALICE IMAGE



Appendix H Motivated Strategies for Learning Questionnaire

MOTIVATED STRATEGIES FOR LEARNING QUESTIONNAIRE

PLEASE WRITE YOUR NAME CLEARLY IN THE SPACE BELOW:

_____

THANK YOU FOR YOUR HELP IN THIS STUDY!!!!!!

Part A. Motivation

The following questions ask about your motivation for and attitudes about this class. Remember there are no right or wrong answers. Answer the questions about how you study in this class as accurately as possible. Use the scale below to answer the questions. If you think the statement is very true of you, circle 7; if a statement is not at all true of you, circle 1. If the statement is more or less true of you, find the number between 1 and 7 that best describes you.

1	2	3	4	5	6	7
not at all true of me						very true of me

1.	In a class like this, I prefer course material that really challenges me so I can learn new things.	1	2	3	4	5	6	7
2.	If I study in appropriate ways, then I will be able to learn the material in this course.	1	2	3	4	5	6	7
3.	When I take a test I think about how poorly I am doing compared with other students.	1	2	3	4	5	6	7
4.	I think I will be able to use what I learn in this course in other courses.	1	2	3	4	5	6	7
5.	I believe I will receive an excellent grade in this class.	1	2	3	4	5	6	7
6.	I'm certain I can understand the most difficult material presented in the readings for this course.	1	2	3	4	5	6	7
7.	Getting a good grade in this class is the most satisfying thing for me right now.	1	2	3	4	5	6	7
8.	When I take a test I think about items on other parts of the test I can't answer.	1	2	3	4	5	6	7
9.	It is my own fault if I don't learn the material in this course.	1	2	3	4	5	6	7
10.	It is important for me to learn the course material in this class.	1	2	3	4	5	6	7

		not at all true of me					very true of me	
11.	The most important thing for me right now is improving my overall grade point average, so my main concern in this class is getting a good grade.	1	2	3	4	5	6	7
12.	I'm confident I can learn the basic concepts taught in this course.	1	2	3	4	5	6	7
13.	If I can, I want to get better grades in this class than most of the other students.	1	2	3	4	5	6	7
14.	When I take tests I think of the consequences of failing.	1	2	3	4	5	6	7
15.	I'm confident I can understand the most complex material presented by the instructor in this course.	1	2	3	4	5	6	7
16.	In a class like this, I prefer course material that arouses my curiosity, even if it is more difficult to learn.	1	2	3	4	5	6	7
17.	I am very interested in the content area of this course.	1	2	3	4	5	6	7
18.	If I try hard enough, then I will understand the course material.	1	2	3	4	5	6	7
19.	I have an uneasy, upset feeling when I take an exam.	1	2	3	4	5	6	7
20.	I'm confident I can do an excellent job on the assignments and tests in this course.	1	2	3	4	5	6	7
21.	I expect to do well in this class.	1	2	3	4	5	6	7
22.	The most satisfying thing for me in this course is trying to understand the content as thoroughly as possible.	1	2	3	4	5	6	7
23.	I think the course material in this class is useful for me to learn.	1	2	3	4	5	6	7

		not at all true of me						very true of me
24.	When I have the opportunity in this class, I choose course assignments that I can learn from even if they don't guarantee a good grade.	1	2	3	4	5	6	7
25.	If I don't understand the course material, it is because I didn't try hard enough.	1	2	3	4	5	6	7
26.	I like the subject matter in this course.	1	2	3	4	5	6	7
27.	Understanding the subject matter of this course is very important to me.	1	2	3	4	5	6	7
28.	I feel my heart beating fast when I take an exam.	1	2	3	4	5	6	7
29.	I'm certain I can master the skills being taught in this class.	1	2	3	4	5	6	7
30.	I want to do well in this class because it is important to show my ability to my family, friends, employer, or others.	1	2	3	4	5	6	7
31.	Considering the difficulty of this course, the teacher, and my skills, I think I will do well in this class.	1	2	3	4	5	6	7

Part B. Learning Strategies

The following questions ask about your learning strategies and study skills for this class. **Again, there are no right or wrong answers. Answer the questions about how you study in this class as accurately as possible.** Use the same scale to answer the remaining questions. If you think the statement is very true of you, circle 7; if a statement is not at all true of you, circle 1. If the statement is more or less true of you, find the number between 1 and 7 that best describes you.

1	2	3	4	5	6	7
not at all true of me						very true of me

32.	When I study the readings for this course, I outline the material to help me organize my thoughts.	1	2	3	4	5	6	7
33.	During class time I often miss important points because I'm thinking of other things.	1	2	3	4	5	6	7
34.	When studying for this course, I make up questions to help focus my reading.	1	2	3	4	5	6	7
35.	I usually study in a place where I can concentrate on my course work.	1	2	3	4	5	6	7
36.	When reading for this course, I make up questions to help focus my reading.	1	2	3	4	5	6	7
37.	I often feel so lazy or bored when I study for this class that I quit before I finish what I planned to do.	1	2	3	4	5	6	7
38.	I often find myself questioning things I hear or read in this course to decide if I find them convincing.	1	2	3	4	5	6	7
39.	When I study for this class, I practice saying the material to myself over and over.	1	2	3	4	5	6	7
40.	Even if I have trouble learning the material in this class, I try to do the work on my own, without help from anyone.	1	2	3	4	5	6	7

		not at all true of me						very true of me
41.	When I become confused about something I'm reading for this class, I go back and try to figure it out.	1	2	3	4	5	6	7
42.	When I study for this course, I go through the readings and my class notes and try to find the most important ideas.	1	2	3	4	5	6	7
43.	I make good use of my study time for this course.	1	2	3	4	5	6	7
44.	If course readings are difficult to understand, I change the way I read the material.	1	2	3	4	5	6	7
45.	I try to work with other students from this class to complete the course assignments.	1	2	3	4	5	6	7
46.	When studying for this course, I read my class notes and the course readings over and over again.	1	2	3	4	5	6	7
47.	When a theory, interpretation, or conclusion is presented in class or in the readings, I try to decide if there is good supporting evidence.	1	2	3	4	5	6	7
48.	I work hard to do well in this class even if I don't like what we are doing.	1	2	3	4	5	6	7
49.	I make simple charts, diagrams, or tables to help me organize course material.	1	2	3	4	5	6	7
50.	When studying for this course, I often set aside time to discuss material with a group of students from the class.	1	2	3	4	5	6	7
51.	I treat the course material as a starting point and try to develop my own ideas about it.	1	2	3	4	5	6	7
52.	I find it hard to stick to a study schedule.	1	2	3	4	5	6	7

		not at all true of me						very true of me
53	When I study for this class, I pull together information from different sources, such as lectures, readings, and discussions.	1	2	3	4	5	6	7
54.	Before I study new course material thoroughly, I often skim it to see how it is organized.	1	2	3	4	5	6	7
55.	I ask myself questions to make sure I understand the material I have been studying in this class.	1	2	3	4	5	6	7
56.	I try to change the way I study in order to fit the course requirements and the instructor's teaching style.	1	2	3	4	5	6	7
57.	I often find that I have been reading for this class but don't know what it was all about.	1	2	3	4	5	6	7
58.	I ask the instructor to clarify concepts I don't understand very well.	1	2	3	4	5	6	7
59.	I memorize key words to remind me of important concepts in this class.	1	2	3	4	5	6	7
60.	When course work is difficult, I either give up or only study the easy parts.	1	2	3	4	5	6	7
61.	I try to think through a topic and decide what I am supposed to learn from it rather than just reading it over when studying for this course.	1	2	3	4	5	6	7
62.	I try to relate ideas in this subject to those in other courses whenever possible.	1	2	3	4	5	6	7
63.	When I study for this course, I go over my class notes and make an outline of important concepts.	1	2	3	4	5	6	7
64.	When reading for this class, I try to relate the material to what I already know.	1	2	3	4	5	6	7

		not at all true of me						very true of me
65.	I have a regular place set aside for studying.	1	2	3	4	5	6	7
66.	I try to play around with ideas of my own related to what I am learning in this course.	1	2	3	4	5	6	7
67.	When I study for this course, I write brief summaries of the main ideas from the readings and my class notes.	1	2	3	4	5	6	7
68.	When I can't understand the material in this course, I ask another student in this class for help.	1	2	3	4	5	6	7
69.	I try to understand the material in this class by making connections between the readings and the concepts from the lectures.	1	2	3	4	5	6	7
70.	I make sure that I keep up with the weekly readings and assignments for this course.	1	2	3	4	5	6	7
71.	Whenever I read or hear an assertion or conclusion in this class, I think about possible alternatives.	1	2	3	4	5	6	7
72.	I make lists of important items for this course and memorize the lists.	1	2	3	4	5	6	7
73.	I attend this class regularly.	1	2	3	4	5	6	7
74.	Even when course materials are dull and uninteresting, I manage to keep working until I finish.	1	2	3	4	5	6	7
75.	I try to identify students in this class whom I can ask for help if necessary.	1	2	3	4	5	6	7
76.	When studying for this course I try to determine which concepts I don't understand very well.	1	2	3	4	5	6	7
77.	I often find that I don't spend very much time on this course because of other activities.	1	2	3	4	5	6	7

		not at all true of me						very true of me
78.	When I study for this class, I set goals for myself in order to direct my activities in each study period.	1	2	3	4	5	6	7
79.	If I get confused taking notes in class, I make sure I sort it out afterwards.	1	2	3	4	5	6	7
80.	I rarely find time to review my notes or readings before an exam.	1	2	3	4	5	6	7
81.	I try to apply ideas from course readings in other class activities such as lecture and discussion.	1	2	3	4	5	6	7

Appendix I Accounting Examination

Following is the first examination given in Financial Accounting 1623, covering the first five weeks of the course.

WRITE THE LETTER OF THE BEST ANSWER IN THE SPACE PROVIDED.

1.___ Adjusting entries are
   a. Recorded on a daily basis as transactions occur
   b. Not posted to the general ledger
   c. Made at the end of an accounting period
   d. Not required under accrual-basis accounting

2.___ GreedyDeveloper Company purchased land for $15,000 in 1995. In 1997, the land is valued at $60,000. The land would appear on the company's books in 1997 at

   a. $15,000
   b. $60,000
   c. $45,000
   d. $75,000

3.___ The basic accounting equation is
   Assets + liabilities = owners' equity
   Assets = liabilities + owners' equity
   Assets + owners' equity = liabilities
   Liabilities - owners' equity = assets

4.___ Distributions by a corporation to its stockholders are called
   a. Withdrawals
   b. Retained earnings
   c. Income
   d. Dividends

5.___ When equipment is purchased with a cash down payment and a signed note for the balance, the net effect will be
   a. An increase in assets
   b. A decrease in liabilities
   c. A decrease in assets
   d. Both b and c

6.___ Which of the following ratios measures short-term liquidity?
   a. Current ratio
   b. Inventory turnover ratio
   c. Times interest earned
   d. Return on stockholders' equity

7.___ Which of the following would be classified as a current asset?
   a. Accounts payable
   b. Land
   c. Accounts receivable
   d. Capital stock

8.___ Prepaid expense accounts are usually classified as
   a. Assets
   b. Liabilities
   c. Expenses
   d. Revenues

9.___ On June 30, 1996, BozoClown Co. purchased a two-year accident insurance policy at a cost of $12,000 and debited Prepaid Insurance for the entire amount. The policy covers the period July 1, 1996, to June 30, 1998. The adjusting entry needed on December 31, 1996, includes a debit to

   Insurance Expense for $3,000
   Insurance Expense for $9,000
   Prepaid Insurance for $3,000
   Prepaid Insurance for $9,000

10.___ Economic resources that are owned or controlled by an enterprise are called
   a. Assets
   b. Liabilities
   c. Revenues
   d. Gains

11.___ The debts, or obligations, of a company are called
   a. Assets
   b. Liabilities
   c. Owners' equity
   d. Net income

12.___ Expense and revenue accounts appear on the
   a. Balance sheet
   b. Income statement
   c. Retained earnings statement
   d. Funds statement

13.___ Costs that are incurred during the normal operations of a business to generate revenues are called

a. Losses
b. Liabilities
c. Expenses
d. Assets

14.___ GoodSushi, Inc. purchased $27,000 of merchandise from DayOldBait Co. by making a 25 percent cash down payment and signing a 90-day note for the balance. The cost of the merchandise to DayOldBait Co. was $22,000. The entry by GoodSushi, Inc. to record the transaction would

a. Increase assets
b. Decrease liabilities
c. Decrease assets
d. Decrease owners' equity

15.___ The following information is available for Ellis Company:

Ellis Company
Partial Balance Sheet
December 31, 1997 and 1996

	1997	1996
Accounts receivable.....	$500,000	$470,000
Allowance for uncollectible accounts.....	(25,000)	(20,000)
Net accounts receivable.....	$475,000	$450,000
Inventories at lower of cost or market.....	$600,000	$550,000

Ellis Company
Partial Income Statement
For the Year Ended December 31, 1997 and 1996

	1997	1996
Net credit sales.....	$2,500,000	$2,200,000
Net cash sales.....	500,000	400,000
Net sales.....	$3,000,000	$2,600,000
Cost of goods sold.....	$2,000,000	$1,800,000
Selling, general, and administrative expenses.....	300,000	270,000
Other expenses.....	50,000	30,000
Total operating expenses.....	$2,350,000	$2,100,000

The accounts receivable turnover for 1997 is computed by

$2,350,000 ÷ $462,500
$2,500,000 ÷ $462,500
$2,500,000 ÷ $475,000
$3,000,000 ÷ $485,000

16.___ During the year, DoingGood Company earned revenues of $114,000 and incurred $98,000 for various operating expenses. There are 1,250 shares of stock outstanding. Earnings per share is
a. $12.50
b. $12.80
c. $8.80
d. $8.50

17.___ During 1997, FatDog Corporation had revenues of $92,000 and expenses of $64,000. Dividends of $14,000 were paid during the year and additional stock was issued for $3,700. If total assets and total liabilities on January 1, 1997, were $65,000 and $28,000, respectively, how much is owners' equity on December 31, 1997?

a. $68,700
b. $54,700
c. $40,700
d. $32,700

18.___ The transactions carried out by GonnaGetRich Corporation during the year caused an increase in total assets of $33,500 and a decrease in total liabilities of $12,250. If no additional stock was issued during the year and dividends of $7,850 were paid, what was the net income for the year?

a. $53,600
b. $45,750
c. $29,100
d. $13,400

19.___ Assuming no other changes and that assets have increased by $50,000, liabilities have decreased $10,000, capital stock has remained unchanged, and expenses were $80,000, by how much did owners' equity increase or decrease and what were revenues for the period, respectively?

Owners' equity increased $60,000; revenues were $140,000
Owners' equity decreased $60,000; revenues were $149,000
Owners' equity increased $40,000; revenues were $20,000
Owners' equity decreased $40,000; revenues were $20,000

20.___ On December 31, 1996, the balance in the Retained Earnings account is $18,500. On December 31, 1997, the balance of Retained Earnings is $21,300. During 1997, dividends of $4,200 were declared and paid. Based on this information, net income for 1997 is

a. $2,800
b. $7,000
c. $2,100
d. $4,200

WRITE YOUR SOLUTION(S) IN THE SPACE PROVIDED.

(21.)
The following financial statement was prepared by Hopeless Corporation's accountant.

Hopeless Corporation
Balance Sheet
December 31, 1997

Assets		Liabilities and Stockholders' Equity	
Cash	$ 2,200	Accounts Payable	$ 2,500
Accounts Receivable	7,000	Notes Payable	?
Inventory	18,000	Total Liabilities	$ 8,600
Building	?	Capital Stock (10,000 shares @ $10 per share)	$100,000
Total Assets	$149,000	Retained Earnings	?
		Total Stockholders' Equity	?
		Total Liabilities and Stockholders' Equity	?

Based on the above Balance Sheet for Hopeless Corporation, what are the correct balances for the accounts listed below:

(1) Building _____
(2) Notes Payable _____
(3) Total Liabilities and Stockholders' Equity _____
(4) Total Stockholders' Equity _____
(5) Retained Earnings _____

(22.)
Joe Bleaux, the bookkeeper of Bubba Oustalet Enterprises, Inc., thinks that the following journal entries may lead to adjusting entries at December 31, 1997.

Feb. 1	Prepaid Insurance.....	720	
	Cash.....		720
Mar. 31	Cash.....	5,025	
	Rent Revenue.....		5,025
May 1	Legal Service Expense.....	1,500	
	Cash.....		1,500
Aug. 1	Property Tax Expense.....	3,600	
	Cash.....		3,600

Joe Bleaux has gathered the following information:

(1) The insurance premium is for the 12-month period ending February 1, 1998.

(2) The rent revenue represents rent received from a tenant for the period March 31, 1997, to September 30, 1997.

(3) The legal service expense is for the services of Dana Pock, attorney-at-law, for the 12-month period ending April 30, 1998.

(4) The property tax expense is for the county's fiscal year, which ends July 31, 1998.

MAKE ANY ADJUSTING ENTRIES REQUIRED AT DECEMBER 31, 1997..

(OMIT EXPLANATIONS.)

(23.)

Record the following transactions in journal entry form without descriptions.

(1) Sold merchandise for $1,000 cash; cost of merchandise sold was $500.

(2) Borrowed $10,000 from a bank.

(3) Issued stock for $3,500.

(4) Purchased equipment costing $25,000; gave cash of $10,000 and a note for the remainder.

(5) Paid off the loan in transaction 2 plus $100 interest.

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Vita

David Michael Harris is a seventh generation Texan, born in Houston, Texas, on March 14, 1947, the first son of Mary Gayle Harris and Edwin F. Harris. After receiving a Bachelor of Business Administration Degree from the University of Texas at Austin in 1970, he entered the University of Houston Graduate School of Business in September 1970. While attending graduate school at the University of Houston, he passed the Uniform CPA Examination. In December 1971, he received a Master of Science in Accountancy from the University of Houston and entered public accounting with Arthur Andersen & Company. In 1973, he accepted employment with Exxon Company, USA as a financial analyst and between 1973 and 1979 was promoted through several positions in fully integrated independent subsidiaries. In 1979, he joined Eden Corporation, a subsidiary of General Homes, as Vice President and Controller. Since 1979, he has served as the Chief Financial Officer of several large and small organizations in a variety of industries. In 1993, he entered graduate school in the College of Education at the University of Texas at Austin, seeking a Ph.D. with a specialization in Instructional Technology. Currently, he teaches accounting at the University of Texas at Austin, St. Edward's University, and Austin Community College, maintains an active consulting practice, and serves as an officer and a director of several closely held corporations.

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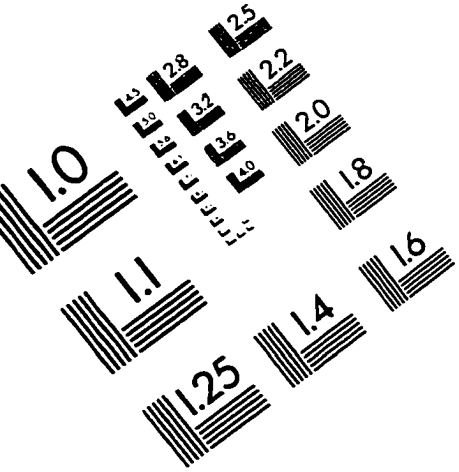
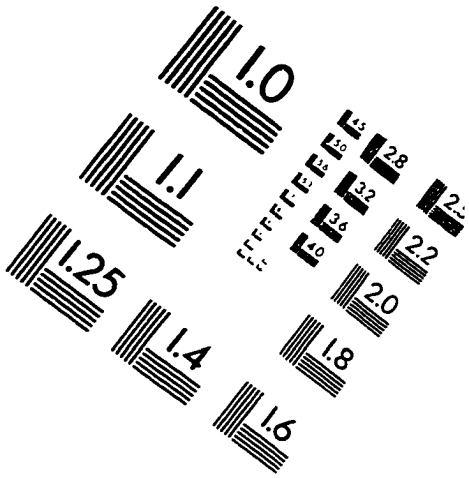
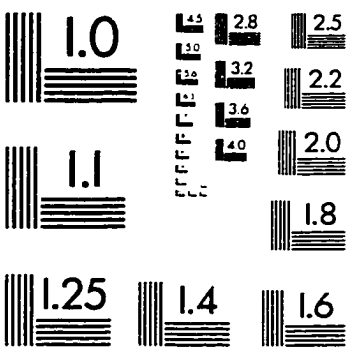
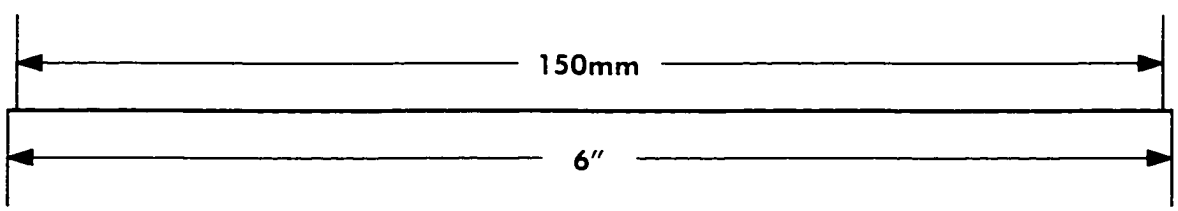
This dissertation was typed by David Michael Harris.

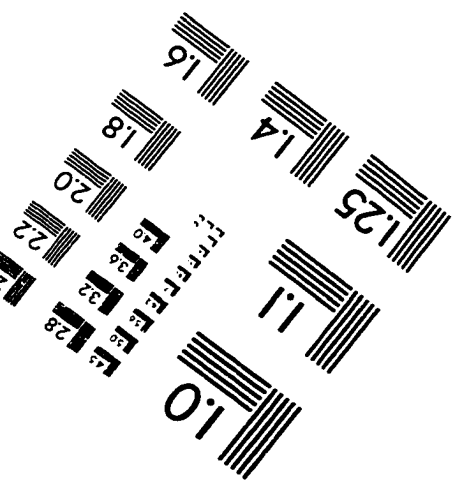
IMAGE EVALUATION TEST TARGET (QA-3)

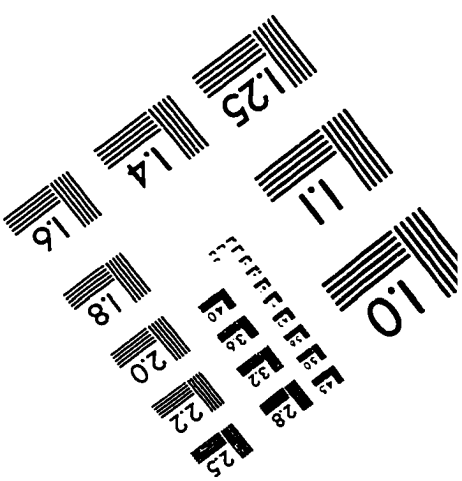












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