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The Development Of The Metacognitive Elements Of Study Scale

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THE DEVELOPMENT OF THE
METACOGNITIVE ELEMENTS OF STUDY SCALE

by

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Bachelor of Arts, Creighton University, 1992
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A Dissertation
Submitted to the Graduate Faculty
of the
University of North Dakota
in partial fulfillment of the requirements
for the degree of
Doctor of Philosophy

Grand Forks, North Dakota
May
1999
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ABSTRACT

Current theories suggest that metacognitive skills are an important aspect of effective studying. However, few learning and study questionnaires assess the metacognitive components of studying and those that do often assume that certain strategies are more appropriate than others, regardless of the person or the task. The questionnaire developed in this research was designed to measure the metacognitive elements of study strategies, regardless of the type of strategies used. This questionnaire should provide additional information regarding a person's metacognitive skills, beyond what is assessed by other measures of studying ability.

The new questionnaire (Metacognitive Elements of Study Scale; MESS) was designed based on three theoretical constructs: (a) Knowledge of Self and Task, (b) Knowledge of Alternate Study Strategies, and (c) Self-Monitoring Ability. Statistical analyses did not support the proposed three-construct model. Therefore, a factor analysis of the MESS items was performed, resulting in two viable scales: (a) Prediction and Planning, and (b) Study Techniques and Their Control. The two-scale solution is consistent with some theoretical models of metacognitive skill (Flavell, 1978; Schraw, 1994; Tei & Stewart, 1985). The revised MESS (based on the 20 items that loaded highly on either factor) demonstrated adequate internal consistency and test-retest reliability.
Validity of the MESS was assessed using research participants' grade point averages (GPA's) and their performance on another measure of learning, the Motivated Strategies for Learning Questionnaire (MSLQ). Scores on the MESS factors were significantly correlated with GPA, as well as with similar constructs on the MSLQ. Additionally, hierarchical regression analyses indicated that the MESS accounts for a significant amount of the variance in GPA not accounted for by either American College Testing (ACT) scores or MSLQ scores.

It may be possible to use the MESS to identify college students with deficits in metacognitive ability. Once identified, those students may benefit from training programs aimed at improving metacognitive skills. Current literature regarding the effectiveness of such programs is discussed.
To Mom and Dad
CHAPTER I

INTRODUCTION

The ability to evaluate and regulate one's thoughts and actions is an important aspect of human behavior. Although self-regulation is central to people's day to day interactions, it has been studied most in relation to learning.

Over the last twenty years, there has been increased interest in measuring aspects of learning and studying, particularly as they are controlled by self-regulation. In the context of learning and studying, self-regulation is generally known as metacognition. This paper offers a new questionnaire designed to assess the metacognitive components of studying among college students. This study is designed to increase understanding of individual differences in self-regulation, particularly as self-regulation pertains to study behavior.

Although there does not seem to be a concise definition of metacognition, existing definitions generally refer to a knowledge of one's own cognitive processes. Metacognition has also been defined as knowledge of strategies and control (Brown, Armbruster, & Baker, 1986), planning, testing, revising, and evaluating learning strategies (Wang, Haertel, & Walber, 1990), people and their "cognitive tasks, goals, actions, and experiences" (Flavell, 1979, p. 906), knowledge concerning strategies, tasks, and people (Flavell, 1985), and knowledge of the learning situation and self-regulatory...
activities (Tei & Stewart, 1985). Everson, Tobias, and Laitusis (1997) stated that, "Students with effective metacognitive skills accurately estimate their knowledge in a variety of domains, monitoring their on-going learning, update their knowledge, and develop effective plans for new learning" (p. 1).

Additionally, a variety of terms such as metacognition, self-regulation, meta-learning, and meta-memory have been coined in an effort to delineate a specific skill or behavior. Unfortunately, there is a large amount of overlap among the definitions of these terms. For example, Biggs (1985) used the term meta-learning to describe a task that, "...requires, first, that students are aware of task demands and of their intentions of how, or even whether, to meet those demands, and, second, that they assess realistically, and exert control over, their own cognitive resources" (p. 185). This definition is similar to many definitions of metacognition. Therefore, in an effort to reduce the ambiguity of these terms for the reader, the remainder of this paper will use the term metacognition, with the assumption that it incorporates aspects of self-regulation, learning, comprehension, and memory.

A chronological review of some of the past and present models of metacognition in learning, as well as a review of learning questionnaires, may help the reader better understand the proposed questionnaire. This review is not meant to be exhaustive, but will provide the reader with information regarding a variety of theoretical models and assessment techniques.
Models of Metacognition

Early models of metacognition generally involved study behaviors (including performing the “correct” study behaviors) and attitudes towards learning (Wren, 1941). Following World War II, though, the emphasis of learning research shifted to reading speed and comprehension, because poor learning was considered primarily a reading problem (Bliss & Mueller, 1993). The focus of study behavior research shifted back to study attitudes and behaviors in the 1960's and although the current models are more comprehensive, many of them continue to assess attitudes and/or behaviors related to studying.

Early research in metacognition was performed primarily with children aged nine and under. It was believed, in the early 1970's, that metacognitive development was relatively complete by about third grade (Brown, 1980). Although some researchers thought that metacognitive abilities, including those pertaining to learning and studying, continued to develop and mature into adulthood, this area was not heavily pursued until the early and mid 1980's, when researchers such as Flavell (1979, 1985) and Biggs (1985, 1987a) became involved in the area. Since the mid 1980's, the importance of metacognition for successful learning even into adulthood has received considerable attention.

Additionally, until the early 1970's, use of “correct” study strategies was considered a paramount issue in learning research (see Brown, Armbruster, & Baker, 1986). How and when students chose to use strategies such as note-taking and underlining were assessed in an effort to predict academic success. It was assumed that
certain study strategies were superior regardless of the characteristics of the student or the task. Some research (Brown & Smiley, 1978) supported this assumption, finding that students who spontaneously used “correct” strategies did remember more.

However, this belief began to be challenged by the 1980's. According to Brown, Armbruster, and Baker (1986):

Training [students] in such cookbook methods [e.g., SQ3R]...may be a reasonable recipe for learning certain texts for certain purposes - if the learner understands why these activities are appropriate. But if the learner does not understand the significance of these activities, does not know how to check that the strategies are resulting in the desired end result, does not know what the desired end result is,...then it is not surprising that instruction in the study recipe is less successful at producing expert studiers than one would like. (p. 66)

From this statement, it appears reasonable to conclude that a student’s repertoire of study strategies (including both “correct” and “incorrect” methods) and ability to choose a strategy that fits the task at hand are more important than a student’s ability to use only “correct” strategies in learning situations. In other words, the ability of the learner to adjust to the learning situation, content to be learned, or method of examination is paramount. Although research in this area is mixed (Brown & Smiley, 1978), this is consistent with studies that found that use of strategies such as underlining, outlining, and note-taking, particularly when those strategies are not spontaneously performed by the
student, is no more effective than rereading material in an effort to learn it (Anderson & Armbruster, 1984; Kardash, Amland, & Kulhavy, 1984).

One of the earlier comprehensive models of learning was developed by Michael, Michael, and Zimmerman (1972). The model involved six aspects: (a) academic interest - love of learning (interest in courses and learning), (b) study methods (specific techniques used when studying), (c) manipulation (using power or manipulation to achieve academic goals), (d) alienation towards authority (feeling isolated from the academic environment), (e) academic drive - conformity (meeting teacher and instructional expectations), and (f) study anxiety (tension related to studying and examinations). These six aspects were hypothesized to be the important components of successful learning.

A model developed by Schmeck, Ribich, and Ramanaiah (1977) was based upon the tenets of cognitive psychology. The importance of successfully encoding, storing, and retrieving information using learning skills such as organization and elaboration (which likely lead to deep processing) was central to this model (see Schmeck, 1983, 1988).

One of the more comprehensive early models of learning was proposed by Biggs (1976, 1978, 1985, 1987a, 1987b, 1988). He proposed that learning situations were affected by both personal factors (i.e., knowledge, ability) and situational factors (e.g., task, teaching method). These personal and situational factors affected performance outcome (examinations) directly, as well as indirectly, mediated through learning processes (e.g., motives, strategies). He later proposed three styles of learning processes,
surface, deep, and achieving, each dimension having different motives and strategies. Additionally, by 1985 the term metalearning had become a significant component of Biggs’ theory. Metalearning referred to using learning strategies that were congruent with learning motives.

Flavell (1979) developed one of the earliest models that specifically addressed how metacognition related to learning. He proposed that cognitive monitoring, a type of metacognition primarily related to reading, was composed of metacognitive experiences, metacognitive knowledge, actions (strategies), and goals (tasks). Metacognitive experiences were thoughts and feelings related to an intellectual task. Metacognitive knowledge included an understanding of cognitive functions of self and others. Actions were the behaviors and cognitions used to achieve goals, which were the objective of any "cognitive enterprise." Later work by Flavell (1985) placed more emphasis on metacognitive experiences (such as a feeling that one does not understand something being studied) and metacognitive knowledge (including knowledge about the person, the task, and the learning strategies).

Similar models were proposed by Schraw (1994) and Tei and Stewart (1985). Both models described two kinds of metacognitive knowledge: (a) knowledge of cognition (information about one’s cognitive strengths and weaknesses and learning strategies) and (b) regulation of cognition (planning and monitoring cognitive strategies). Both studies reported that people with better knowledge of cognition and regulation of cognition performed better on cognitive tasks. Romainville (1994) reached a similar conclusion, stating that, “...high achieving students seem to be aware of more cognitive...
rules and to evoke metacognitive knowledge about cognitive processes and cognitive
results more frequently” (p. 359).

Another early model of learning that incorporated metacognition was proposed by
Sternberg (1980, 1986). Sternberg suggested that expert problem solvers used three
processes when solving problems: (a) knowledge-acquisition components, (b)
performance components, and (c) metacomponents. Knowledge-acquisition components
were used when learning new material or retrieving previously-learned material.
Performance components were those skills that were used when executing a task.
Metacomponents were higher-order processes that control lower-order processes, such as
selecting steps to solve a problem or monitoring the solution to a problem.

Additional theoretical contributions to the field of metacognition and learning
were made by Brown, Armbruster, and Baker (1986). They viewed metacognition as a
combination of knowledge (of strategies and one's strengths and weaknesses) and control
(including planning and self-monitoring). More specifically, metacognition was
comprised of understanding: (a) the nature of the text (such as its difficulty and relevance)
(b) the task (for example, the type of test that will be given), (c) study strategies and "fix-
up" strategies (those designed to compensate for failed comprehension, such as looking
back over previous material when one is confused), and (d) oneself. Although Flavell
(1979), Sternberg (1980, 1986), and Brown et al. (1986) stressed the importance of
metacognition in learning, later learning questionnaires continued to give metacognition
little attention.
At approximately the same time, Wang, Haertel, and Walberg (1990) studied 30 characteristics that they believed could affect learning. They found that one of the most important factors related to student learning was metacognition, even more important than peers, parental support, student demographics, or cognitive factors. Although they developed a comprehensive list of factors related to learning, they did not create a tool to assess those factors.

One of the most recent theories of learning incorporated metacognition into self-directed studying. Warkentin and Bol (1997) proposed that self-directed studying consisted of four features: (a) monitoring (assessing concentration, comprehension, and memory), (b) regulating (modifying study deficits), (c) planning (goal-setting activities), and (d) evaluating (reflecting upon learning). Each of these features involved aspects of metacognition. The fourth feature, evaluation, appeared to be the most important, and in fact, higher achieving students were more likely to engage in higher quality and more precise evaluating activities (1997). Additional research has indicated that metacognition (specifically comprehension monitoring) appears to be consistent across domains (Schraw, Dunkle, Bendixen, & Roedel, 1995; Schraw & Nietfeld, 1998; Schraw & Roedel, 1994) and at least partly independent of intellectual ability (Veenman, Elshout, & Meijer, 1997).

Learning Questionnaires

One of the earliest measures of learning was the Study Habits Inventory (SHI; Wren, 1941). The SHI was designed to assess study attitudes and behaviors. Research using the SHI (Gordon, 1941) indicated a negligible relationship between SHI scores and
average course grades among nursing students, $r (118) = .107$. Following the development of the SHI, research shifted to reading speed and comprehension.

It was not until the 1950's, with the development of the Survey of Study Habits and Attitudes (SSHA; Brown & Holtzman, 1953, 1966), that research shifted back to learning behaviors and attitudes. The SSHA was designed to provide a single score that assessed academic achievement. It was developed using four scales: (a) delay avoidance, (b) work methods, (c) teacher approval, and (d) education acceptance. These scale scores were combined to create an overall study orientation score. Goldfried and D'Zurilla (1973) found practically no relationship between overall SSHA scores and grade point average, $r = .07$. Furthermore, the individual scale scores reportedly have little predictive validity and poor psychometric properties (Bray, Maxwell, & Schmeck, 1980).

In 1972, the Study Attitudes and Methods Scale (SAMS; Michael, Michael, & Zimmerman, 1972), which was based on six aspects of learning proposed by the authors, was developed. A correlational study (Miller & Michael, 1972) found that the six subscales of the SAMS exhibit modest, yet significant relationships with grade point average, ranging from $r (280) = -.13$ (study anxiety) to $r (280) = .25$ (academic drive - conformity).

Schmeck, Ribich, and Ramanaiah (1977) created true/false statements regarding learning and studying that addressed the aspects of their model of learning (discussed previously). The responses were subjected to factor analysis. This resulted in the development of the Inventory of Learning Processes (ILP). The ILP included four subscales: (a) synthesis - analysis (later called deep processing, a measure of how well...
students critically organize and evaluate what they study), (b) study methods (later called methodological study, it assesses for the use of "good" study strategies), (c) fact retention (remembering factual information), and (d) elaborative processing (including making information personally relevant and using visual imagery to help one remember).

Unfortunately, the relationship between ILP subscale scores and grade point averages is modest at best, with correlations reaching a maximum of .23 (Rohwer, 1984).

In 1978, Biggs developed the Learning Process Questionnaire (LPQ) and the Study Process Questionnaire (SPQ), designed for secondary and tertiary students respectively. These questionnaires assessed students' learning motives and strategies. Data regarding the psychometric properties of the LPQ and SPQ are mixed (Bolen, Wurm, & Hall, 1975; Christensen, Massey, & Isaacs, 1991; Hall, Bolen, & Gupton, 1995; Hargett, Bolen, & Hall, 1994; Watkins & Hattie, 1980); however, at least one study (Hall, Bolen, & Gupton, 1995) found no significant relationships between grade point average and surface, deep, or achieving approaches.

In 1983, the Learning and Study Strategies Inventory (LASSI; Weinstein, Schulte, & Cascallar) was developed. It consisted of ten subscales: (a) attitude (relevance/importance of being in college), (b) anxiety (stress caused by academic tasks), (c) concentration (ability to attend), (d) time management, (e) motivation (desire to succeed), (f) information processing (connecting personal experiences with new information), (g) self-testing (examining how well one is remembering material), (h) selecting main ideas, (i) test strategies (how well one prepares for and takes exams), and (j) study aids (using and creating things to help in studying). No direct measures of
metacognition were included. Also, no studies examining the LASSI's relationship to grade point average or test scores is known to this author; however, Weinstein, Zimmermann, and Palmer (1988) reported a moderate relationship between scores on the information processing subscale of the LASSI and scores on the ILP (Schmeck, Ribich, & Ramanaiah, 1977), $r = .60$.

In 1990, Nixon and Frost developed the Study Habits and Attitudes Inventory to investigate, "...study skills, attitudes, and other aspects of students' behavior that might be predictive of academic success" (p. 1076). Again, although scores on this measure were significantly correlated with GPA, $r (55)= .66$, no metacognitive components were included.

The next major contribution in learning questionnaires was made by Pintrich, Smith, Garcia, and McKeachie (1991). The Motivated Strategies for Learning Questionnaire (MSLQ) assessed both motivation and learning strategies. The MSLQ was an 81-item instrument, "...designed to assess college students' motivational orientations and their use of different learning strategies for a college course" (Pintrich, et al., 1991, p. 3). The MSLQ provided scores on six Motivation Scales: (a) intrinsic goal orientation, (b) extrinsic goal orientation, (c) task value (how important or interesting the student deems the task), (d) control of learning beliefs (belief that one's studying effort will "pay off"), (e) self-efficacy for learning and performance, and (f) test anxiety. Additionally, the MSLQ provided scores on nine Learning Strategies Scales: (a) rehearsal, (b) elaboration, (c) organization, (d) critical thinking (applying previous knowledge to new situations), (e) metacognitive self-regulation (awareness, knowledge, and control of
cognition), (f) time and study environment, (g) effort regulation (controlling effort and attention), (h) peer learning (collaborating with peers), and (i) help seeking. As mentioned above, this questionnaire does include a measure of metacognitive ability. Pintrich, Smith, Garcia, and McKeachie (1993) reported that the relationships between the 15 subscales of the MSLQ and course grade ranged from $r(380) = .02$ (extrinsic goal orientation, help seeking) to $r(380) = .41$ (self-efficacy for learning and performance). No information regarding the relationship between MSLQ subscale scores and grade point average is available.

In 1991, Kardash and Amlund developed the Learning Strategies Survey (LSS). Their questionnaire addressed two factors: (a) covert cognitive processes and (b) overt cognitive processes. Covert cognitive processes included internal elaboration and organization of material. Overt cognitive processes referred to observable strategies to encoding material (e.g., underlining, writing summaries). Kardash and Amlund (1991) concluded that covert internal strategies were more important predictors of learning outcomes than were overt study strategies; however, metacognitive components were not a significant aspect of their covert strategies. The authors reported a significant relationship between grade point average (high versus low) and the mean of each factor, $F(2,554) = 15.82$.

An unnamed instrument for assessing strategies in learning, developed by Chissom and Iran-Nejad (1992), identified four scales contributing to learning: (a) reflective metacognition, (b) procrastination, (c) rote memorization, and (d) procedural metacognition. Reflective metacognition was "...critical thinking strategies involving
high simultaneous processing and dynamic self-regulation" (p. 1002). Procrastination included strategies that delay learning. Rote memorization referred to memorization strategies, and procedural metacognition referred to "recipe-like" strategies for learning. The reflective metacognition factor included items that assess metacognitive skills as defined in this paper. Chissom and Iran-Nejad (1992) found significant relationships between grade point average and reflective metacognition, $r (56)= .44$, procrastination, $r (56)= -.25$, and rote memorization, $r (56)= .36$.

Another study questionnaire created in 1992 was the Learning-Thinking Style Inventory (LTSI; RiCharde). The LTSI consisted of four scales: (a) perceptual modality preference (auditory, reading, kinesthetic, or visual), (b) distractability, (c) metacognition, and (d) analytic-global tendency. The metacognitive scale was designed to, "...assess metacognition as reflected in the evaluation of one's cognitive behavior and problem solving strategies" (Zhang & RiCharde, 1997, p. 5). In other words, the scale asked the respondent to answer questions and then asked the respondent to estimate the probability of getting each question correct and to describe the strategy he/she used to solve each question. Analyses (RiCharde, 1992) revealed a significant main effect for grade point average, $F = 2.77$.

Additionally, in 1992 the Self-Regulated Learning Inventory (SRLI; Lindner & Harris) was developed. Self-regulated learning referred to the extent that students were, "...metacognitively, motivationally, and behaviorally active participants in their own learning" (Zimmerman, 1990, p. 4). The SRLI was based on a five-scale model of self-regulation that assessed: (a) metacognition (planning, monitoring, and evaluating...
cognitions), (b) motivation (one’s desire to learn), (c) learning strategies (specific skills and planning), (d) environmental utilization/control (help seeking and managing the learning environment), and (e) contextual sensitivity (one’s ability to gauge task demands and personal resources). The authors found a significant relationship between SRLI scores and grade point average, $r(104) = .56$. As this review suggests, it was not until approximately 1992, more than 10 years after the importance of metacognition was hypothesized, that learning/studying questionnaires consistently measured metacognitive ability and included that information as a significant aspect of learning.

Finally, in 1994, the Metacognitive Awareness Inventory (MAI; Schraw & Dennison) was developed. The MAI was solely and specifically designed to measure metacognitive awareness, without also assessing non-metacognitive information, and was the first questionnaire known to this author to do so. The MAI consisted of 52 items and yielded two scale scores: (a) knowledge of cognition and (b) regulation of cognition. Knowledge of cognition was described as, “an awareness of one’s strengths and weaknesses, knowledge about strategies and why and when to use those strategies” (Schraw & Dennison, 1994, p. 471). Regulation of cognition referred to, “…knowledge about planning, implementing, monitoring, and evaluating strategy use” (Schraw & Dennison, 1994, p. 471). The authors reported a significant relationship between the two scales of the MAI and reading comprehension test scores, $F = 2.31$.

Summary

As can be seen from the examples given, there is no consensus on what aspects of learning and studying should be included in theories of classroom learning or
questionnaires of this sort. Although there is considerable overlap, each of the
aforementioned questionnaires assesses for novel information in the hope of being a
superior predictor of academic achievement, usually grade point average (GPA).

As noted previously, metacognition was considered paramount in many models of
learning. However, with few exceptions, the modern questionnaires do not include a
large metacognitive component. In other words, when metacognitive ability is included
in learning questionnaires, only a small portion of the questionnaire items are devoted to
it. Of the questionnaires that do include a metacognitive scale, most also assume that
there are "correct" and "incorrect" study strategies and assess whether the student is using
the "correct" study techniques. For example, to determine the use of “correct” study
strategies, learning questionnaires included items such as, “I outline a report or a
composition before I write it” (Michael et al., 1985), and “When studying for this class, I
read my class notes and the course readings over and over again” (Pintrich et al., 1991).
Additionally, many of the current study skill questionnaires ask students to evaluate their
study skills (a subjective task) instead of asking students to simply report their behaviors
and experiences (an objective task).

Current Study

Many of the previous study skill questionnaires do a fair job of predicting GPA
(and other indices reflecting learning and studying), but I wish to develop a questionnaire
that provides a unique contribution to the measurement of learning and study skills. The
proposed questionnaire is designed to gain additional information, beyond what current
questionnaires are assessing, regarding the students' metacognitive ability related to
studying. Use of this questionnaire, in conjunction with other instruments, should provide the advisor or academic counselor with more accurate information about a student's likelihood for academic success. It should also serve as a valuable research tool for understanding metacognition. The future benefits of a more comprehensive understanding of college students' academic ability include early identification of college students who have weak studying and learning strategies. This early identification, combined with training, could have profound effects on the academic success of students with poor study and learning skills (see discussion).

My position is that there are not necessarily "correct" and "incorrect" study techniques, but instead, that different types of academic tasks and personal characteristics require different study techniques. Therefore, a student's academic achievement should be correlated to his/her ability to identify when he/she or the situation requires a different study technique, change study techniques when problems occur, and monitor the effectiveness of that change (i.e., metacognitive ability), instead of just using the "correct" techniques. This position is supported by Anderson and Armbruster (1984), Brown, Armbruster, and Baker (1986), and Kardash, Amland, and Kulhavy (1984) as discussed previously. Additionally, Weinstein, Zimmermann, and Palmer (1988) reported, "Most of the recommended or 'good' study practices in study skills inventories have not been empirically validated. Therefore, a high score on a study skills inventory does not necessarily mean that a student's study practices are effective" (p. 27). Finally, Hattie, Biggs, and Purdie (1996) reported that improving students' learning is less effective when
study deficits are targeted. In other words, teaching “correct” study skills does not necessarily improve academic performance.

The questionnaire developed in this research is one of the first to assess primarily metacognitive constructs of task and self, knowledge of alternate study strategies, and self-monitoring, while also assuming that the particular study strategy/strategies one uses are less important than the ability to recognize when a study strategy is not working and change to another, hopefully more effective, study strategy. The items in the new questionnaire generally ask students to report their study behaviors and experiences instead of evaluating their study skills. This questionnaire is primarily concerned with the metacognitive components of studying. The question is, are students aware of when things are and are not going well, and if so, can they modify their behavior to change the outcome (test performance, GPA)?

The proposed questionnaire is different from the MAI in its theoretical basis, although both questionnaires are designed to provide a comprehensive measure of metacognitive ability. The MAI sub-divides metacognition into two scales: (a) knowledge of cognition, and (b) regulation of cognition (as discussed previously), while the proposed questionnaire attempts to sub-divide metacognition into three scales: (a) knowledge of task and self, (b) knowledge of alternate study strategies, and (c) self-monitoring. Knowledge of task and self encompasses one's awareness of one's own strengths and weaknesses and the demands of the task. These can be related to a specific test, a course, or academics, in general. Task and self were combined because they both assess awareness of the situation. Knowledge of alternate study strategies includes
questions assessing what methods students use when studying and whether students can choose different strategies for different types of tasks. Self-monitoring measures whether students can both identify when study techniques are not working and modify their studying strategies to improve their academic results.

These three scales were theoretically developed and are similar to the two kinds of metacognition described by Flavell (1978), Schraw (1994), and Tei and Stewart (1985) except that the older models tend to combine knowledge of task and self and knowledge of alternate study strategies into one construct. In Flavell's model, metacognitive knowledge measured both knowledge of task and self and knowledge of alternate study strategies, while metacognitive experiences measured self-monitoring. In Schraw's (1994) and Tei and Stewart's (1985) model, knowledge of cognition was similar to knowledge of task and self and knowledge of alternate study strategies, while regulation of cognition was similar to self-monitoring.

The proposed questionnaire is different from most other learning and study assessment questionnaires in that it attempts to provide a comprehensive measure of metacognitive ability without also assessing non-metacognitive elements. It was hypothesized that this new questionnaire would provide a unique contribution to the prediction of GPA, over and above the contribution provided by a comprehensive learning strategies questionnaire.

During the pilot study, a pilot-version of the new questionnaire, hereby referred to as the Metacognitive Elements of Study Scale (MESS), was created and administered to a group of research participants. Analyses from the pilot study allowed for revision of the
MESS. The revised form of the MESS and the Motivated Strategies for Learning Questionnaire (MSLQ) were completed by a separate group of research participants during study two to determine the MESS's validity. Grade point averages and American College Testing (ACT) scores were also attained to further validate the MESS. Finally, study three consisted of re-administration of the revised MESS to a subset of research participants from study two to determine the instrument's reliability.
CHAPTER II

PILOT STUDY

Method

Research Participants

Research participants consisted of 104 undergraduate Introductory Psychology students. They received extra course credit for their participation.

Measures

Materials consisted of a 40-item theoretically-based self-report questionnaire (MESS) developed by the author of this study and a brief version (M-C 1(10); Strahan & Gerbasi, 1972) of the Marlow-Crowne Social Desirability Scale (Crowne & Marlowe, 1960). To create the MESS, items that appeared to contribute to each of the three constructs: 1) awareness of task and self, 2) awareness of alternate study strategies, and 3) self-monitoring, were created. The initial item pool consisted of 62 items, with at least 14 items proposed as representative of each of the three constructs. A group of four experts reviewed the original items, evaluating how accurately the item both assessed metacognition in studying and fit the definition (stated previously) of one of the three constructs. This resulted in the elimination of 22 items that did not accurately reflect their constructs as anticipated and the revision of eight items to improve clarity. The
remaining 40 items were constructed according to a 5-point Likert format and formed the pilot version of the MESS.

The M-C 1(10) is a 10-item questionnaire designed to assess one's tendencies to provide socially appropriate responses, even when those responses are likely to be inaccurate. Correlations between the M-C 1(10) and the original Marlow-Crowne Social Desirability Scale ranged in the .80s to .90s over four samples of participants, suggesting that the M-C 1(10) provides an adequate measure of social desirability when compared to a more comprehensive questionnaire (Strahan & Gerbasi, 1972). The M-C 1(10) is generally administered as a true/false questionnaire; however, in this study it was administered according to a 4-point Likert format to allow for more variability in responses and therefore, to serve as a more useful tool for data analyses (see Appendix A). The M-C 1(10) was administered to detect questions that may be overly influenced by social desirability.

Procedure

Research participants completed the study in groups of 10 or fewer students. After reading and signing the Informed Consent form, they completed the MESS and the M-C 1(10) respectively. The order of the MESS and M-C 1(10) was not varied for two reasons: first, the questionnaires generally took less than 15 minutes to complete suggesting that fatigue was probably not a factor; and second, the MESS was of primary importance and if participants did become fatigued or began to rush near the end of the study, it was preferable that their best performance occur while completing the MESS.
Upon completion of the questionnaires, the participants were debriefed, given their extra credit forms, and thanked for their participation.

Results

The pilot version of the MESS consisted of 40 items. Of those items, 11 were proposed to represent knowledge of task and self, 16 to represent knowledge of alternate study strategies, and 13 to represent self-monitoring.

Initially, corrected item-scale correlations were computed to assess the correlation of each item in a scale with the three scale scores. Nine items exhibiting weak correlations with the assigned scale when compared to the correlations with other scales were eliminated. Additionally, six questions were reworded to improve clarity and increase the number of negatively worded items. All remaining 31 items demonstrated a sufficient range of responses (at least three of the five possible Likert responses were used by 10 or more participants).

Next, a principal components analysis was completed for each revised scale to ensure that each scale was dominated by a single dimension. Results of the principal components analysis suggested that the second scale, knowledge of alternate study strategies, represented two discrete factors. However, when the five weakest questions (those questions whose corrected item-total correlations were $r [104] = 0.25$ or less) were removed, the multi-dimensionality of the remaining items was substantially reduced (still assessing knowledge of alternate study strategies).

Next, corrected item-total correlations were calculated between the remaining 26 items and the three scales to verify that each question correlated most highly with its
assigned scale. Nine items did not meet this criterion, but were retained (either in their original or a modified form) because they appeared to exhibit content validity and correlated highly with both their hypothesized construct and another construct. It was hypothesized that at least some of these nine items would correlate most highly with their own scale when using a larger sample (study two). A correlation matrix of the three scales indicated that the constructs were related; however, because the correlation coefficients were only moderately elevated, each scale was assumed to be measuring a different and distinct attribute (see Table 1). Knowledge of task and self included eight items, knowledge of alternate study strategies included ten items, and self-monitoring included eight items.

<table>
<thead>
<tr>
<th>Scales</th>
<th>MESS Knowledge of Task and Self</th>
<th>MESS Knowledge of Alternate Study Strategies</th>
<th>MESS Self-Monitoring</th>
</tr>
</thead>
<tbody>
<tr>
<td>MESS Knowledge of Task and Self</td>
<td>(.80)</td>
<td>.20*</td>
<td>.60**</td>
</tr>
<tr>
<td>MESS Knowledge of Alternate Study Strategies</td>
<td>(.65)</td>
<td></td>
<td>.49**</td>
</tr>
<tr>
<td>MESS Self-Monitoring</td>
<td></td>
<td></td>
<td>(.71)</td>
</tr>
</tbody>
</table>

* $p \leq .05$; ** $p \leq .01$

( ) internal consistency reliability estimates (Cronbach's alpha)
Finally, correlations were calculated between the responses on each MESS question and the M-C 1(10) score. None of those correlations was statistically significant at the 0.05 level.

**Summary**

In the pilot study, a pilot version of the Metacognitive Elements of Study Scale (MESS) was developed. The 40-item pilot version was administered to 104 research participants. Fourteen items were removed due to statistical weaknesses. This resulted in a 26-item questionnaire.
CHAPTER III

STUDY TWO

Method

Research Participants

Research participants were 206 undergraduate Introductory Psychology students, 82 males and 124 females. Participants ranged in age from 17 years old to 31 years old, with a mean age of 19.1 years old. The vast majority (177 or 86%) of the students were completing their first year of college, 19 (9%) were second-year students, five (2%) were third-year students, and five (2%) were fourth-year students.

Eighty participants (28 males, 52 females) returned for a follow-up study. Participants in the follow-up study ranged in age from 17 years old to 31 years old, with a mean age of 19.2 years old. The vast majority (69 or 86%) of the students in the follow-up study were completing their first year of college, 7 (9%) were second-year students, two (2.5%) were third-year students, and two (2.5%) were fourth-year students.

Measures

Materials consisted of a consent form allowing the author to obtain the student’s Grade Point Average (GPA) and American College Testing (ACT) composite test score, a demographic questionnaire, the 32-item revised MESS, and the MLSQ (Pintrich et al.,...
1991; see Appendix B). The items from the revised MESS and their corresponding constructs are included in Appendix C.

Six new items were developed in order to increase the number of items representing each scale. Those six items, in addition to the 26 items that were retained from the pilot version of the MESS, resulted in a revised 32-item MESS. Of those 32 items, 11 represented knowledge of task and self, 11 represented knowledge of alternate study strategies, and 10 represented self-monitoring.

Procedure

Research participants completed the study in groups of 10 or fewer. After reading and signing the Informed Consent form, they completed the Student Consent for Release of Educational and Financial Records, the demographic questionnaire, the MESS, and the MSLQ, respectively. The order of the MESS and MSLQ was not varied for similar reasons as described in the pilot study. Upon completion of the questionnaires, the participants were debriefed, given their extra credit forms, and thanked for their participation. They were also informed that they could sign up for an optional follow-up study to earn additional extra credit. Names and telephone numbers of those students interested in the follow-up study were obtained prior to their departure from study two.

Research participants in the follow-up study completed the study in groups of 10 or fewer students. After reading and signing the Informed Consent form, the participants completed the MESS for a second time. Upon completion of the questionnaire, the participants were debriefed, given their extra credit forms, and thanked for their participation.
Results

As in the pilot study, the correlation of each item with the three scale scores was computed (see Table 2). Of the 32 MESS items, 10 did not exhibit their highest loading on their assigned scale. Some of those 10 items loaded similarly on multiple scales, while others exhibited considerably higher loadings on scales other than their own. Of those ten items, only two represented items from the pilot study that did not correlate most highly with their assigned scale. Also, only two of the ten items represented new items (from the six new items added to the MESS at the beginning of study two); items that were not used in the pilot version of the MESS. The content validity of the 10 items was examined and the weakest items from the MESS were removed; however, the problem remained. As noted above, similar problems were noted when trying to validate the pilot of the MESS during the pilot study.

Due to the difficulty in validating the three theoretical constructs proposed in the Introduction, principal axes factor analyses with oblique rotation were performed with two through five factors extracted. A factor with an eigenvalue of two or greater was considered to be a viable factor. Two was chosen as the cut-off because it limited the viable factors to three, whereas a cut-off of one (typically used in research) would have allowed for an unrealistically high number of factors (nine) given the number of questionnaire items. Although the initial eigenvalues of three factors were greater then two, a three-factor solution produced one factor that consisted of only two items. Therefore, the two-factor structure, which appeared to represent the data well and included 20 of the 32 MESS items, was used to create the MESS.
Table 2. Item by Scale Correlations for the Revised MESS

<table>
<thead>
<tr>
<th>Item Number</th>
<th>MESS Knowledge of Task and Self</th>
<th>MESS Knowledge of Alternate Study Strategies</th>
<th>MESS Self-Monitoring</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.49*</td>
<td>.20</td>
<td>.43</td>
</tr>
<tr>
<td>2</td>
<td>.47</td>
<td>.43*</td>
<td>[.54]</td>
</tr>
<tr>
<td>3</td>
<td>.34</td>
<td>.25*</td>
<td>[.36]</td>
</tr>
<tr>
<td>4</td>
<td>.17</td>
<td>[.46]</td>
<td>.37*</td>
</tr>
<tr>
<td>5</td>
<td>.18*</td>
<td>.01</td>
<td>.05</td>
</tr>
<tr>
<td>6</td>
<td>.28</td>
<td>[.37]</td>
<td>.35*</td>
</tr>
<tr>
<td>7</td>
<td>.29*</td>
<td>.10</td>
<td>.20</td>
</tr>
<tr>
<td>8</td>
<td>[.59]</td>
<td>.20</td>
<td>.38*</td>
</tr>
<tr>
<td>9</td>
<td>.16</td>
<td>.32*</td>
<td>.31</td>
</tr>
<tr>
<td>10</td>
<td>.43*</td>
<td>.28</td>
<td>.33</td>
</tr>
<tr>
<td>11</td>
<td>.57*</td>
<td>.21</td>
<td>.45</td>
</tr>
<tr>
<td>12</td>
<td>-.05</td>
<td>.29*</td>
<td>.28</td>
</tr>
<tr>
<td>13</td>
<td>[.28]</td>
<td>.15</td>
<td>.23*</td>
</tr>
<tr>
<td>14</td>
<td>.50*</td>
<td>.11</td>
<td>.35</td>
</tr>
<tr>
<td>15</td>
<td>.10</td>
<td>.28*</td>
<td>[.35]</td>
</tr>
<tr>
<td>16</td>
<td>.16</td>
<td>.49*</td>
<td>.44</td>
</tr>
<tr>
<td>17</td>
<td>.38</td>
<td>.18</td>
<td>.42*</td>
</tr>
<tr>
<td>18</td>
<td>.35*</td>
<td>.05</td>
<td>.20</td>
</tr>
<tr>
<td>19</td>
<td>[.64]</td>
<td>.18</td>
<td>.39*</td>
</tr>
<tr>
<td>20</td>
<td>.30</td>
<td>.43*</td>
<td>.30</td>
</tr>
<tr>
<td>21</td>
<td>-.12</td>
<td>.15*</td>
<td>-.03</td>
</tr>
<tr>
<td>22</td>
<td>.20</td>
<td>.48</td>
<td>.50*</td>
</tr>
<tr>
<td>23</td>
<td>.43*</td>
<td>.31</td>
<td>.36</td>
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<tr>
<td>24</td>
<td>.12</td>
<td>.24*</td>
<td>.22</td>
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<td>25</td>
<td>.08</td>
<td>.22*</td>
<td>.20</td>
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<td>26</td>
<td>.14</td>
<td>.39</td>
<td>.44*</td>
</tr>
<tr>
<td>27</td>
<td>.21*</td>
<td>.16</td>
<td>[.28]</td>
</tr>
<tr>
<td>28</td>
<td>.31*</td>
<td>[.44]</td>
<td>.30</td>
</tr>
<tr>
<td>29</td>
<td>.24</td>
<td>.54</td>
<td>.57*</td>
</tr>
<tr>
<td>30</td>
<td>.41*</td>
<td>.13</td>
<td>.31</td>
</tr>
<tr>
<td>31</td>
<td>.44</td>
<td>.45*</td>
<td>.44</td>
</tr>
</tbody>
</table>

* corrected item-total correlation (correlation of items with their assigned scale)
[ ] items whose correlation with an alternate scale is greater than their correlation with their assigned scale
Two scales were constructed based upon items exhibiting substantial loadings (0.35 or greater) on one factor and weaker loadings (0.25 or less) on the alternate factor. The two scales were labeled: (a) Prediction and Planning, and (b) Study Techniques and Their Control. Prediction and planning includes items that assess one's ability to accurately predict the difficulty of courses/tests, predict one's performance, and prepare for courses/tests. Study techniques and their control includes items that assess one's knowledge of a variety of study strategies and ability to change strategies to achieve one's goals. The two scales accounted for 31% of the total variance of the items. The scale scores were significantly correlated with one another, $r (206) = .25, p < .05$, suggesting that they are related and may each represent components of a more comprehensive variable (i.e., cognitive ability or learning ability). However, the correlation was low enough to indicate that the two scales are measuring largely independent constructs. See Table 3 for a summary of the factor analysis. The items and their factor loadings are presented in Table 4.

Internal consistency reliability estimate (Cronbach's alpha) for the scales (a) prediction and planning, and (b) study techniques and their control were .82 and .78 respectively. Additionally, both scales of the MESS demonstrated adequate test-retest reliability, $r (80) = .82, p \leq .01$ and $r (80) = .76, p \leq .01$, respectively.

In order to assess convergent and discriminant validity, correlations between the MESS scale scores and the 15 subscale scores on the MSLQ were calculated (see Table 5). It was predicted that there would be significant relationships among most of...
Table 3. Summary of Factor Analysis

<table>
<thead>
<tr>
<th>Factor</th>
<th>Number of Items (Loadings ≥ .35)</th>
<th>Eigenvalue</th>
<th>Percent of Variance</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Prediction and Planning</td>
<td>11</td>
<td>6.65</td>
<td>20.77</td>
<td>20.77</td>
</tr>
<tr>
<td>2. Study Techniques and Their Control</td>
<td>9</td>
<td>3.13</td>
<td>9.79</td>
<td>30.56</td>
</tr>
</tbody>
</table>

Table 4. Item Loadings for Factors 1 and 2

<table>
<thead>
<tr>
<th>Item</th>
<th>Loading</th>
</tr>
</thead>
<tbody>
<tr>
<td>19. Even when I study a lot, I do not do well on tests.</td>
<td>.79</td>
</tr>
<tr>
<td>11. I do poorly on exams, even when I feel well prepared.</td>
<td>.77</td>
</tr>
<tr>
<td>8. I do as well on tests as I expect to. [r]</td>
<td>.68</td>
</tr>
<tr>
<td>14. I find that test questions are very different from what I expected.</td>
<td>.63</td>
</tr>
<tr>
<td>30. I am surprised at how difficult courses are.</td>
<td>.57</td>
</tr>
<tr>
<td>1. I can predict what kinds of items will be on a test. [r]</td>
<td>.50</td>
</tr>
<tr>
<td>23. I get discouraged and do not try as hard in a course, after getting a low test grade.</td>
<td>.47</td>
</tr>
<tr>
<td>10. I underestimate how much time I will need to study for a test.</td>
<td>.46</td>
</tr>
<tr>
<td>17. Test questions match the material that I study. [r]</td>
<td>.44</td>
</tr>
<tr>
<td>13. My grade point average (GPA) accurately reflects how much I study. [r]</td>
<td>.37</td>
</tr>
<tr>
<td>18. I can predict what college courses will be easy for me. [r]</td>
<td>.35</td>
</tr>
<tr>
<td>29. If I do poorly in a course, I try to figure out why. [r]</td>
<td>.03</td>
</tr>
<tr>
<td>22. If I am doing poorly in a course, I evaluate the approach I am taking and try to find out what I am doing wrong. [r]</td>
<td>.02</td>
</tr>
<tr>
<td>16. I look up words that I do not know when I am studying. [r]</td>
<td>-.06</td>
</tr>
<tr>
<td>26. After taking the first test in a course, I review the test questions to try to figure out what kinds of things the instructor asks about so that I can study differently for later tests. [r]</td>
<td>.00</td>
</tr>
<tr>
<td>4. If I do poorly on a test that I studied hard for, I study in a different way for the next exam in that course. [r]</td>
<td>-.03</td>
</tr>
<tr>
<td>15. I study in different ways for different classes. [r]</td>
<td>-.05</td>
</tr>
<tr>
<td>12. For me, different types of tests require different types of study techniques. [r]</td>
<td>-.17</td>
</tr>
<tr>
<td>6. When I get a test back, I look up the answers to questions that I missed. [r]</td>
<td>.12</td>
</tr>
<tr>
<td>20. Cramming for exams is my primary method of studying.</td>
<td>.12</td>
</tr>
</tbody>
</table>

[r] indicates reverse-scored item

The scales of the MESS and MSLQ. It was further predicted that MESS scale 1, prediction and planning, would correlate most highly with the MSLQ subscales control of

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Table 5. Correlations Between the MESS and MSLQ

<table>
<thead>
<tr>
<th>MSLQ</th>
<th>MESS Prediction and Planning</th>
<th>MESS Study Techniques and Their Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td><strong>.18</strong></td>
</tr>
<tr>
<td>Intrinsic Goal Orientation</td>
<td></td>
<td><strong>.45</strong></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td><strong>.27</strong></td>
</tr>
<tr>
<td>Extrinsic Goal Orientation</td>
<td></td>
<td><strong>.38</strong></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td><strong>.38</strong></td>
</tr>
<tr>
<td>Task Value</td>
<td></td>
<td><strong>.38</strong></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td><strong>.24</strong></td>
</tr>
<tr>
<td>Control of Learning</td>
<td></td>
<td><strong>.38</strong></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td><strong>.38</strong></td>
</tr>
<tr>
<td>Self-Efficacy</td>
<td></td>
<td><strong>.38</strong></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td><strong>.42</strong></td>
</tr>
<tr>
<td>Test Anxiety</td>
<td></td>
<td><strong>.59</strong></td>
</tr>
<tr>
<td>7</td>
<td></td>
<td><strong>.52</strong></td>
</tr>
<tr>
<td>Rehearsal</td>
<td></td>
<td><strong>.42</strong></td>
</tr>
<tr>
<td>8</td>
<td></td>
<td><strong>.39</strong></td>
</tr>
<tr>
<td>Elaboration</td>
<td></td>
<td><strong>.66</strong></td>
</tr>
<tr>
<td>9</td>
<td></td>
<td><strong>.48</strong></td>
</tr>
<tr>
<td>Organization</td>
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<td>10</td>
<td></td>
<td><strong>.38</strong></td>
</tr>
<tr>
<td>Critical Thinking</td>
<td></td>
<td><strong>.24</strong></td>
</tr>
<tr>
<td>11</td>
<td></td>
<td><strong>.18</strong></td>
</tr>
<tr>
<td>Metacognitive Self-Regulation</td>
<td></td>
<td><strong>.24</strong></td>
</tr>
<tr>
<td>12</td>
<td></td>
<td><strong>.24</strong></td>
</tr>
<tr>
<td>Time and Study Environment</td>
<td></td>
<td><strong>.24</strong></td>
</tr>
<tr>
<td>13</td>
<td></td>
<td><strong>.24</strong></td>
</tr>
<tr>
<td>Effort Regulation</td>
<td></td>
<td><strong>.24</strong></td>
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<td>14</td>
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<td><strong>.24</strong></td>
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<tr>
<td>Peer Learning</td>
<td></td>
<td><strong>.24</strong></td>
</tr>
<tr>
<td>15</td>
<td></td>
<td><strong>.24</strong></td>
</tr>
<tr>
<td>Help Seeking</td>
<td></td>
<td><strong>.24</strong></td>
</tr>
</tbody>
</table>

* p ≤ .05; ** p ≤ .01
learning and self-efficacy, while MESS scale 2, study techniques and their control, would correlate highly with the MSLQ subscales regarding learning strategies (rehearsal, elaboration, and organization), metacognitive self-regulation, and effort regulation. Significant relationships between MESS scale scores and the MSLQ subscales test-anxiety, peer learning, and help seeking were not expected.

As was expected, there were significant correlations between each MESS scale and most of the 15 MSLQ subscales, suggesting that both questionnaires are measuring related constructs. Also as expected, MESS scale 1 (prediction and planning) correlated most highly with the MSLQ self-efficacy subscale, $r (206) = .60, p < .01$. Since the self-efficacy subscale is a measure of a student's academic self-confidence, it is not surprising that it is strongly correlated with that student's ability to predict academic outcomes. This ability is reflected in MESS items such as, "I do as well on tests as I expect to," or conversely, "I am surprised at how difficult courses are." MESS scale 1 correlated moderately, but significantly, with the MSLQ control of learning subscale, as well. An unexpected significant relationship occurred between MESS scale 1 and the MSLQ subscale test anxiety, $r (206) = -.51, p < .01$, which suggests that students who exhibit poor prediction and planning may experience higher levels of test anxiety. Their heightened test anxiety may contribute to their difficulties regarding prediction and planning and/or be the result of poor prediction and planning.

As expected, MESS scale 2 (study techniques and their control) correlated strongly with all of the MSLQ subscales reflecting study techniques (rehearsal, $r (206) = .42, p < .01$, elaboration, $r (206) = .59, p < .01$, organization, $r (206) = .52, p < .01$, and
critical thinking, \( r (206) = .42, p \leq .01 \). Additionally, MSLQ subscales assessing metacognitive self-regulation, \( r (206) = .66, p \leq .01 \), and effort regulation, \( r (206) = .43, p \leq .01 \), (both measures of a student's ability to control internal processes) correlated strongly with MESS scale 2, although effort regulation also correlated highly with MESS scale 1, \( r (206) = .42, p \leq .01 \), perhaps due to a relationship between items assessing prediction (MESS scale 1: "I do poorly on exams, even when I feel well prepared.") and items assessing control (MESS scale 2: "If I do poorly in a course, I try to figure out why.").

As expected, the MESS scales exhibited weaker correlations with the MSLQ subscale peer learning (a measure of how frequently the student works with others such as using study groups), \( r (206) = .06 \) and \( r (206) = .24 \) on MESS scales 1 and 2 respectively. The MESS scales also exhibited weaker correlations with the MSLQ subscale help seeking (a measure of how frequently a student seeks academic assistance), \( r (206) = .18 \) and \( r (206) = .24 \) on MESS scales 1 and 2 respectively. Additionally, MESS scale 2 exhibited a non-significant correlation with the MSLQ subscale, test anxiety, \( r (206) = -.10 \), suggesting that a student's knowledge of study techniques and control over them is not significantly affected by anxiety. Since many of the MESS scale 2 items assess study techniques used after receiving feedback regarding test performance (i.e., "When I get a test back, I look up the answers to questions that I missed."), it is likely that test anxiety has less of an effect at this time.

One final measure of construct validity involved the correlation between the MESS scale scores and ACT scores. Because ACT scores are designed to assess how
much a student has learned in the past, it was hypothesized that there would be a significant positive correlation between MESS scales 1 and 2 and ACT scores. Of the 206 total research participants, 157 had ACT scores. ACT scores ranged from 15 to 34, with a mean of 23.68 (SD=4.07). Both MESS scale scores 1 and 2 were significantly correlated with ACT scores, $r(157)=.44$, $p<.01$ and $r(157)=.25$, $p<.01$ respectively. Regarding predictive validity, scales 1 and 2 of the MESS exhibited significant correlations with GPA, $r(206)=.45$, $p<.01$, and $r(206)=.17$, $p<.05$, respectively; however, the correlation between MESS scale 2 and GPA is somewhat weak.

Next, a method was needed to determine the relationship between the MESS and the MSLQ. Of particular interest was the ability of the MESS to predict GPA over and above the predictive ability of the MSLQ. Because the MSLQ consists of 15 subscales, it was not feasible or appropriate to perform regression analyses with all of the subscales. Therefore, the 15 subscales of the MSLQ were subjected to a principal components analysis with varimax rotation to determine a smaller number of dimensions that best represent the scales of the MSLQ and could be used for data analyses. A four-factor solution appeared to represent the subscales well, accounting for 68% of the total variance. The first component reflected subscales assessing Intrinsic Goal Orientation, Task Value, Elaboration, Organization, Critical Thinking, and Metacognitive Self-Regulation and was labeled "Intrinsic Learning" or learning for the sake of increasing knowledge. The second component was most strongly related to subscales assessing Extrinsic Goal Orientation, Rehearsal, Time and Study Environment, and Effort Regulation and was labeled "Extrinsic Learning" or learning to meet outside goals (e.g.,
high grades, respect from peers, et cetera). The third component was associated with subscales assessing Control of Learning, Peer Learning, and Help Seeking and was labeled "Resources." The fourth component reflected subscales assessing Self-Efficacy for Learning and Test Anxiety and was labeled "Confidence." See Table 6 for a summary of the component analysis. The items and their factor loadings are presented in Table 7.

Table 6. Summary of Principal Component Analysis of MSLQ Subscales

<table>
<thead>
<tr>
<th>Component</th>
<th>Eigenvalue</th>
<th>Percent of Variance</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Intrinsic Learning</td>
<td>5.98</td>
<td>39.85</td>
<td>39.85</td>
</tr>
<tr>
<td>2. Extrinsic Learning</td>
<td>1.51</td>
<td>10.09</td>
<td>49.93</td>
</tr>
<tr>
<td>3. Resources</td>
<td>1.46</td>
<td>9.73</td>
<td>59.66</td>
</tr>
<tr>
<td>4. Confidence</td>
<td>1.29</td>
<td>8.63</td>
<td>68.28</td>
</tr>
</tbody>
</table>

A correlation matrix of MESS scales 1 and 2 and MSLQ components 1 through 4 (see Table 8) indicated that MSLQ component 4 (confidence) was most strongly related to MESS scale 1 (prediction and planning). The two subscales that load most heavily on MSLQ component 4 are the subscales that exhibited the highest correlations with MESS scale 1 (self-efficacy for learning and test-anxiety, discussed previously). MSLQ component 1 (intrinsic learning) was most strongly related to MESS scale 2 (study techniques and their control). Again, the six subscales that load on MSLQ component 1 (intrinsic goal orientation, task value, elaboration, organization, critical thinking, and
Table 7. Subscale Loadings for Components 1 Through 4

<table>
<thead>
<tr>
<th>MSLQ Subscale</th>
<th>Component 1</th>
<th>Component 2</th>
<th>Component 3</th>
<th>Component 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>10. Critical Thinking</td>
<td>.80</td>
<td>-.13</td>
<td>.19</td>
<td>.08</td>
</tr>
<tr>
<td>1. Intrinsic Goal Orientation</td>
<td>.77</td>
<td>.23</td>
<td>.01</td>
<td>.12</td>
</tr>
<tr>
<td>8. Elaboration</td>
<td>.74</td>
<td>.36</td>
<td>.24</td>
<td>.03</td>
</tr>
<tr>
<td>3. Task Value</td>
<td>.71</td>
<td>.26</td>
<td>-.04</td>
<td>-.06</td>
</tr>
<tr>
<td>11. Metacognitive Self-Regulation</td>
<td>.66</td>
<td>.50</td>
<td>.23</td>
<td>.21</td>
</tr>
<tr>
<td>9. Organization</td>
<td>.55</td>
<td>.48</td>
<td>.26</td>
<td>-.05</td>
</tr>
<tr>
<td>2. Extrinsic Goal Orientation</td>
<td>.06</td>
<td>.80</td>
<td>-.07</td>
<td>-.30</td>
</tr>
<tr>
<td>7. Rehearsal</td>
<td>.30</td>
<td>.67</td>
<td>.17</td>
<td>-.03</td>
</tr>
<tr>
<td>13. Effort Regulation</td>
<td>.22</td>
<td>.67</td>
<td>.09</td>
<td>.48</td>
</tr>
<tr>
<td>12. Time and Study Environment</td>
<td>.22</td>
<td>.66</td>
<td>.09</td>
<td>.48</td>
</tr>
<tr>
<td>14. Peer Learning</td>
<td>.33</td>
<td>.15</td>
<td>.70</td>
<td>-.05</td>
</tr>
<tr>
<td>15. Help-Seeking</td>
<td>.16</td>
<td>.32</td>
<td>.69</td>
<td>.22</td>
</tr>
<tr>
<td>4. Control of Learning</td>
<td>.44</td>
<td>.22</td>
<td>-.54</td>
<td>.06</td>
</tr>
<tr>
<td>6. Test Anxiety</td>
<td>.05</td>
<td>.14</td>
<td>-.08</td>
<td>-.89</td>
</tr>
<tr>
<td>5. Self-Efficacy for Learning</td>
<td>.46</td>
<td>.40</td>
<td>-.31</td>
<td>.52</td>
</tr>
</tbody>
</table>

Table 8. Correlations of MESS Scales with MSLQ Components

<table>
<thead>
<tr>
<th>Mess Scales</th>
<th>MSLQ Intrinsic Learning</th>
<th>MSLQ Extrinsic Learning</th>
<th>MSLQ Resources</th>
<th>MSLQ Confidence</th>
<th>R²</th>
</tr>
</thead>
<tbody>
<tr>
<td>MESS Prediction and Planning</td>
<td>.24**</td>
<td>.20**</td>
<td>-.11</td>
<td>.62**</td>
<td>.50</td>
</tr>
<tr>
<td>MESS Study Techniques and Their Control</td>
<td>.51**</td>
<td>.37**</td>
<td>.11</td>
<td>.16*</td>
<td>.43</td>
</tr>
<tr>
<td>R²</td>
<td>.27</td>
<td>.15</td>
<td>.03</td>
<td>.39</td>
<td></td>
</tr>
</tbody>
</table>

*p ≤ .05; **p ≤ .01

metacognitive self-regulation) account for most of the highest correlations noted between MESS scale 2 and the MSLQ subscales.
Next, a series of regression analyses was completed to assess the ability of the MESS to predict the MSLQ components. Because both the MESS and the MSLQ are designed to predict academic success (GPA) and because the MESS measures content included in at least one of the MSLQ subscales (metacognitive self-regulation), it was hypothesized that the MESS would also be able to significantly predict MSLQ component scores, particularly MSLQ component 1 which included the subscale metacognitive self-regulation. First, the MESS scale scores were used to predict each of the MSLQ components independently. In the first analysis, MESS scales 1 and 2 (entered as a block) accounted for 27% of the variance in MSLQ component 1 (internal learning), 15% of the variance in MSLQ component 2 (external learning), 3% of the variance in MSLQ component 3 (resources), and 39% of the variance in MSLQ component 4 (confidence).

Next, the unique ability of the MESS to predict achievement was assessed. A regression analysis was completed to determine whether the MESS could predict GPA beyond the predictive ability of ACT scores. See Table 9 for a summary of correlations between MESS scale scores, MSLQ component scores, ACT scores and GPA. MESS factors 1 and 2 (entered as a block) significantly increased the prediction of GPA beyond the predictive ability of ACT scores alone (see Table 10).

Finally, a regression analysis was completed to determine whether the MESS could predict GPA beyond the combined predictive ability of ACT scores with the four components of the MSLQ (see Table 11). MESS scales 1 and 2 (entered as a block) significantly increased the prediction of GPA beyond the combined predictive ability of
ACT scores and MSLQ components (entered as a block). It should be noted, however, that MESS scale 1 appears to contribute considerably more predictive power in determining GPA than MESS scale 2.

Table 9. Correlations Between MESS Scale Scores, MSLQ Component Scores, ACT Scores and GPA

<table>
<thead>
<tr>
<th></th>
<th>ACT Composite Score</th>
<th>GPA</th>
</tr>
</thead>
<tbody>
<tr>
<td>MESS Scale 1</td>
<td>.442**</td>
<td>.447**</td>
</tr>
<tr>
<td>MESS Scale 2</td>
<td>.248**</td>
<td>.172*</td>
</tr>
<tr>
<td>MSLQ Component 1</td>
<td>.144</td>
<td>.080</td>
</tr>
<tr>
<td>MSLQ Component 2</td>
<td>.078</td>
<td>.179*</td>
</tr>
<tr>
<td>MSLQ Component 3</td>
<td>-.282**</td>
<td>-.123</td>
</tr>
<tr>
<td>MSLQ Component 4</td>
<td>.322**</td>
<td>.274**</td>
</tr>
<tr>
<td>ACT Composite Score</td>
<td></td>
<td>.624**</td>
</tr>
</tbody>
</table>

* $p < .05$; ** $p < .01$

Table 10. Hierarchical Regression of GPA on ACT, MESS Scale 1 and Mess Scale 2

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>Beta</th>
<th>$R^2$</th>
<th>$\Delta R^2$</th>
</tr>
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<tr>
<td>Stage 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>79.55**</td>
<td></td>
<td>.39</td>
<td>.39**</td>
</tr>
<tr>
<td>ACT</td>
<td>.99**</td>
<td>.62**</td>
<td>.39</td>
<td>.39**</td>
</tr>
<tr>
<td>Stage 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>-3.83</td>
<td></td>
<td>.39</td>
<td>.39**</td>
</tr>
<tr>
<td>ACT</td>
<td>8.02**</td>
<td>.51**</td>
<td>.39</td>
<td>.39**</td>
</tr>
<tr>
<td>MESS Scale 1</td>
<td>2.89**</td>
<td>.23**</td>
<td>.39</td>
<td>.39**</td>
</tr>
<tr>
<td>MESS Scale 2</td>
<td>.58</td>
<td>.05</td>
<td>.44</td>
<td>.05**</td>
</tr>
</tbody>
</table>

* $p < .05$; ** $p < .01$
Table 11. Hierarchical Regression of GPA on ACT, MSLQ Components 1-4, and MESS Scales 1-2

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>Beta</th>
<th>R²</th>
<th>ΔR²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>77.85**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ACT</td>
<td>9.87**</td>
<td>.63**</td>
<td>.39</td>
<td>.39**</td>
</tr>
<tr>
<td>Stage 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>90.16**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ACT</td>
<td>9.32**</td>
<td>.59**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MSLQ Component 1</td>
<td>-1.31</td>
<td>-.02</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MSLQ Component 2</td>
<td>11.76**</td>
<td>.18**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MSLQ Component 3</td>
<td>1.39</td>
<td>.02</td>
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<tr>
<td>MSLQ Component 4</td>
<td>5.97</td>
<td>.09</td>
<td>.44</td>
<td>.04*</td>
</tr>
<tr>
<td>Stage 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>-18.71</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ACT</td>
<td>8.39**</td>
<td>.53**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MSLQ Component 1</td>
<td>-6.22</td>
<td>-.10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MSLQ Component 2</td>
<td>8.26</td>
<td>.13</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MSLQ Component 3</td>
<td>1.63</td>
<td>.03</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MSLQ Component 4</td>
<td>-3.01</td>
<td>-.05</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MESS Scale 1</td>
<td>3.04**</td>
<td>.24**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MESS Scale 2</td>
<td>.56</td>
<td>.05</td>
<td>.47</td>
<td>.03*</td>
</tr>
</tbody>
</table>

* p ≤ .05; ** p ≤ .01
Summary

Six new items were created, resulting in a 32-item revised MESS. Two hundred
and six research participants completed the revised MESS and the MSLQ, a measure of
learning strategies. The three theoretical constructs proposed in the pilot study could not
be validated. Therefore, the data were factor analyzed resulting in two viable factors.
Two scales were constructed based upon item-loadings on each of the factors. The MESS
scales were labeled "prediction and planning" and "study techniques and their control."
Internal consistency for the two scales ranged from .82 to .78. Test-retest reliability for
the two scales ranged from .82 to .76. The MESS scales were significantly correlated
with MSLQ subscales that proposed to measure similar variables, suggesting convergent
validity. Additionally, both MESS scales were significantly correlated with GPA. To
assess the predictive ability of the MESS over the MSLQ, the 15 MSLQ subscales were
factor analyzed, resulting in four MSLQ components. The MESS scales were able to
account for a significant proportion of variance for each of the four MSLQ components.
The MESS scales significantly increased the prediction of GPA beyond the combined
predictive ability of ACT composite scores and the four components of the MSLQ.
CHAPTER V
DISCUSSION

The purpose of this study was to design a new questionnaire to assess the metacognitive aspects of studying. During the pilot study, the 40-item initial version of the Metacognitive Elements of Study Scale (MESS) was developed and tested. The proposed questionnaire was based on three theoretical constructs of metacognition: (a) knowledge of task and self, (b) knowledge of alternate study strategies, and (c) self-monitoring. Scales were developed based on each of these constructs. Data analysis on the pilot version of the MESS indicated weak support for the three scales. Many of the items exhibited stronger relationships with alternate scales than with their assigned scale. To improve statistical support for the scales, 14 of the weakest items (those items that exhibited weak correlations with the assigned scale) were removed. Study two was designed to validate the MESS created during the pilot study. First, six new items were developed to increase the number of items in each scale. This resulted in a 32-item revised MESS. Data analysis of the revised MESS indicated that the three scales continued to lack statistical support. Scale items continued to exhibit weaker relationships with the assigned scale than with alternate scales (similar to the problems encountered with the pilot version of the MESS). Therefore, a factor-analysis of the revised MESS items was completed to determine whether a different structure better
described the metacognitive aspects under investigation. The factor analysis suggested that the MESS items reflected two factors. Two scales, (a) prediction and planning, and (b) study techniques and their control, were created using items that exhibited their highest loading on each factor. The first scale, prediction and planning, appears to primarily measure internal metacognitive processes such as one’s ability to accurately predict the difficulty of courses/tests, predict one’s performance, and prepare for courses/tests. The second scale, study techniques and their control, appears to primarily measure observable or external metacognitive processes such as one’s use of a variety of study strategies and one’s ability to modify study strategies to reach one’s goals (e.g., high grades). The revised version of the MESS (based on items that exhibited high loadings on one of the two factors) exhibited significant relationships with scales measuring theoretically similar constructs and with GPA and ACT scores. The MESS appeared to be relatively unrelated to scales assessing theoretically unrelated constructs. Additionally, test-retest reliability for the two scales was adequate. Finally, regression analyses indicated that the MESS was able to account for a significant amount of variance in GPA not otherwise accounted for by either ACT composite scores (a measure of prior academic achievement) or the MSLQ (Pintrich, et al., 1991; a measure of learning strategies which includes a subscale on metacognitive self-regulation). Additionally, there was a significant correlation between MESS scale scores and GPA, and MESS scale scores and ACT composite scores, indicating that metacognitive ability is related to measures of both current academic achievement and past learning. Results indicate, however, that MESS scale 1 is a better predictor of ACT composite scores and
GPA than is MESS scale 2. This suggests that academic success is more strongly related to one's ability to anticipate course/test material and one's competence with that material than to one's knowledge of and control over various study strategies.

Therefore, the research hypothesis was supported in that the revised MESS appears to make a unique contribution in accounting for student achievement differences. This unique contribution, which is assumed to be a comprehensive measure of metacognitive ability, provides additional information over and above that provided by the MSLQ (Pintrich, et al., 1991). This unique component of learning is also believed to be relatively ignored by many other learning and study questionnaires.

However, the two scales identified in the MESS do measure information assessed by the Metacognitive Awareness Inventory (MAI; Schraw & Dennison, 1994), the only other questionnaire known to this author to solely assess metacognitive ability as it relates to learning. Both questionnaires include scales measuring knowledge of various study strategies. However, MESS scale 2 (study techniques and their control) appears to include items that assess both scales of the MAI (knowledge of cognition, regulation of cognition). The MAI does not include a separate scale assessing prediction and planning ability (although items reflecting prediction and planning ability are included in the scales of the MAI). Additionally, the MESS is a shorter questionnaire and requires less time to complete. Therefore, the MESS may be both a more comprehensive and faster method to assess metacognitive ability.

As this study suggests, college students exhibit considerable variability in their metacognitive skills (as indicated by the variability of scores on the MESS), with some
students exhibiting deficits in metacognition relative to their peers. This is not a recent finding. In 1973, Bond and Tinker reported that many college students read all study materials in the same way regardless of their reasons for reading the materials or the materials' difficulty. Although Bond and Tinker did not use the term metacognition in their description of college students' study skills, they appeared to be describing a similar concept.

Due to the apparent importance of metacognition for successful learning and academic achievement (Romainville, 1994; Schraw, 1994; Tei & Stewart, 1985) and the current results supporting a relationship between metacognitive ability and academic achievement, it seems reasonable to hypothesize that deficits in metacognitive ability may be associated with academic difficulty. This is supported by Tei and Stewart (1985) who report that, “...less successful students seem almost unaware of deliberate strategies that could be employed....[less successful students] are much more passive; they fail to evaluate spontaneously whether one set of materials is more difficult to learn that another” (p. 47). Fortunately, research suggests that the identification and remedial training of students who demonstrate poor metacognitive skills leads to improved academic performance (Bransford, Stein, Shelton, & Owings, 1980; Brown, Campione, & Dan, 1981; Gambrell & Heathington, 1981; Palinscar, 1981). Although research has investigated the benefits of training both children and adults in metacognitive strategies (see Schraw, 1998 for a review of child metacognitive development), the focus of this paper is on adult metacognitive development.
A variety of models designed to improve metacognitive skills among adults (particularly college students) have been proposed. Although many of these models continue to be in the exploratory stage, preliminary studies have been encouraging, suggesting that metacognitive skills can be improved with training.

According to Tei and Stewart (1985), the following are the important elements of study: (a) having specific goals for a study session, (b) understanding how reading material is structured, (c) extracting information in a purposeful way, and (d) testing oneself to assess knowledge gained. The researchers argued that training students in two metacognitive strategies could have a significant impact on their study behavior and effectiveness, and therefore, on the elements listed above. The first strategy, self-questioning, involved teaching students to ask themselves questions about the material they are learning. The second strategy, summarization, involved processing the most important ideas.

Brown et al. (1986) described the use of informed training and self-control training as techniques to improve metacognitive skills. Informed training refers to not only teaching students various study techniques, but also teaching them why the study techniques are effective. Paris, Newman, and McVey (1982) used this approach with young children and found that the group receiving informed training significantly outperformed the control group academically. It is likely that similar results would be obtained with older students, particularly those who do not understand the rationale behind common study strategies. Self-control training is similar to informed training; however, self-control training also includes teaching students to plan and monitor their
study behavior. Research using college students and both the informed training method and the self-control training method indicated that students who were not diagnosed with learning problems benefitted from the informed training approach; however, students who exhibited learning problems benefitted only from the self-control training.

Biggs (1987b) stated that often low achieving students believe they are incompetent, and therefore, they avoid academic tasks. In response to this tendency, Biggs identified the importance of teaching both study techniques and a healthier attribution style to low achieving students. The suggestion that self-efficacy is an important aspect of learning was also supported by Brown, Bransford, Ferrara, and Campione (1983) and Pressley, Goodchild, Fleet, Zajchowski, and Evans (1989).

Blakey and Spence (1990) developed a list of six strategies designed to enhance metacognitive skills: (a) identifying what students do and do not know, (b) labeling and modeling thinking processes, (c) keeping a diary of thinking processes, (d) learning to plan and monitor learning behavior, (e) reviewing thinking processes, and (f) evaluating thinking processes. Again, this model was developed based on the needs of younger students, but many of the concepts may be equally effective for college students with metacognitive deficits.

Another approach involves modeling and coaching metacognitive strategies (Volet, 1991). In this approach used for computer programing students, a five step metacognitive strategy (defining the problem, developing an algorithm to solve the problem, converting the algorithm into a flow chart, coding from the flow chart into a computer language, and debugging errors/improving the program) was combined with
coaching of instructional techniques and a support network. Students were active participants in the teaching-learning process. Results indicated that students who received this instructional method exhibited improved “cognitive and affective learning outcomes,” when compared to students in a control group.

Hanley (1995) reviewed a college course on critical thinking designed to assist students in deciding which cognitive skills are needed in a situation and then apply those skills to solve problems. The course began by teaching students how their thinking processes work. Next, students learned syllogistic reasoning, causal reasoning, and hypothesis testing. Finally, students used the previously learned techniques to solve problems and make decisions. Evaluations given during the course indicated that students improved their critical thinking skills.

Finally, Hattie, Biggs, and Purdie (1996) performed a meta-analysis on the effects of learning skills interventions. The analysis, based on 51 studies, suggested that the use of mnemonics was quite effective, particularly when the goal was to accurately retain details. Alternatively, when students were required to understand the content of material so that they could transfer it to other situations, training should occur in the teaching of that content rather than in teaching general skills and should involve a high degree of learner activity. Also, if students were to be taught studying strategies, they should also be taught how the strategies work (metacognitive aspects). This is particularly important if transfer of knowledge to other situations was to occur. Finally, results from this meta-analysis suggested that study skills training has more of an effect on a student’s attitude (including attributions for success and failure) than on his/her actual study skills.
Although the current study supports the two-component model of metacognition suggested by Brown, Armbruster, and Baker (1986), Schraw (1994), and Tei and Stewart (1985), a number of limitations warrant consideration. First, demographic information was obtained only from the research participants in study two (who were also in study three). It was assumed that participants in the pilot study (those who contributed to the development of the MESS) were equivalent to participants in studies two and three (those who contributed to the validity and reliability assessments of the MESS). However, because demographic information was not obtained from the participants in the pilot study, it was not possible to verify that the participants from the pilot study were equivalent to the participants in studies two and three.

Another limitation of the current study was the decision to change the brief version of the Marlow-Crowne Social Desirability Scale from a true/false format to a four-point Likert format. Although the Likert format allowed for more variability of scores and therefore, provided more information for data analysis, no data have been published suggesting that a Likert format provides valid or reliable information regarding social desirability.

Additionally, it was not possible to obtain grade point averages from the participants at the same points in their academic career. In other words, some participants' grade point averages were obtained following their first semester of college (when GPAs may presumably be most unstable because they are based on so few credit hours). Other participants' GPAs were obtained after their second, third, or even fourth year of college (depending upon when they participated in the study).
Finally, although the MSLQ provided a measure of metacognitive ability, its fifteen subscale scores proved unwieldy during data analysis. Using a smaller number of components based on the MSLQ subscales provided ease in data analysis, but because these components were developed during this study, there is no information regarding the components’ validity. A different measure with a small number of subscale scores or an overall score would have allowed for both easier and more psychometrically sound data analyses.

A number of directions for future research can be identified. First, more research is needed to evaluate the construct validity of the two scales, (a) prediction and planning, and (b) study techniques and their control, as well as to determine whether the scales are reliable across different samples. This could be achieved by simply replicating the current study using students from other universities, as well as by conducting a similar study with secondary students or non-traditional students (those who are older than typical college students) to determine whether the MESS can be applied to other populations. Additionally, replicating this study with more control over access to GPAs (i.e., using each participant’s GPA during the semester he/she participated or using only students in a designated year in school and GPAs from that same year) may prove fruitful.

Although the current study used undergraduate students in general, it may be interesting to determine if there are differences among students dependent upon their year in school. Therefore, one could compare first-year students with fourth-year students to determine whether year-in-college appeared to affect responses on the MESS items.
Finally, future studies could compare the MESS to the MAI (Schraw & Dennison, 1994), another instrument designed solely to assess metacognition in learning. The MESS and MAI are very similar instruments. As mentioned previously, the MESS includes two scales: (a) prediction and planning, and (b) study techniques and their control. The MAI also includes two scales: (a) knowledge of cognition, and (b) regulation of cognition. Although the MESS and MAI scales were developed in different ways (the MESS was based on items representing three constructs that resulted in two scales, while the MAI was based on items representing eight constructs that resulted in two scales), the resulting questionnaires appear to measure almost identical aspects of learning. The MESS scale prediction and planning is closely related to the MAI scale regulation of cognition, which measures planning, implementing, monitoring, and evaluating learning strategy use. The MESS scale study techniques and their control is closely related to the MAI scale knowledge of cognition, which measures personal strengths and weaknesses and knowledge and control over different study strategies. Because the MESS and MAI are designed to measure similar aspects and appear to do so in a very similar way, a study to determine which questionnaire is more useful as a measure of metacognition would provide valuable information.
APPENDIX A

QUESTIONNAIRES FOR THE PILOT STUDY

Included in this appendix are copies of the forms and questionnaires used in the pilot study. The materials are in the same order as they were given to the participants. The informed consent form and debriefing form are also included.

(a) informed consent form
(b) pilot version of the Metacognitive Elements of Study Scale (MESS)
(c) brief version of the Marlow-Crowne Social Desirability Scale (M-C 1[10])
(d) debriefing form
INFORMED CONSENT FORM

Name of Project Director: Tiffney Yeager

This experiment is designed to evaluate a new survey of college students' studying strategies. Participants will be asked to complete a questionnaire.

I, as a research participant, will be asked to answer a series of questions. This should take approximately 30 minutes. It is highly unlikely that any discomfort will be experienced when completing the questions. To insure strict confidentiality, all information gathered will be kept separate from the names of people who participated in this project and I will be identified by an assigned number only.

In return for my participation, I will receive credit as designated by my professor. I am not required to participate in this study, and my decision to participate or decline participation will not prejudice my relations with the University of North Dakota or the Psychology Department. If I decide to participate, I am free to discontinue my participation at any time without penalty or prejudice.

I have read this "Informed Consent Form," and I have been informed of the nature of the potential risks and procedures. At the end of the study, I will be debriefed by the experimenter regarding the goals of the study. Also, I have received a copy of this document for personal reference. Last, I understand that I can call the investigator, Tiffney Yeager, at 777-3808 or the project advisor, Mark Grabe, at 777-3451 if I have any questions regarding this study.

Participant's Name (printed)  Age

Participant's Signature  Date

Witnessed  Date

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MESS

For each of the following statements, circle the number that corresponds to how well that statement describes you.

1. I can predict what kinds of items will be on a test.

   1  2  3  4  5
always frequently occasionally rarely never

2. I tape record classes in which the instructor talks too fast, so that I can fill in my notes later.

   1  2  3  4  5
always frequently occasionally rarely never

3. I try to figure out material that confuses me, even if I have to study longer.

   1  2  3  4  5
always frequently occasionally rarely never

4. I test myself on the material I am studying.

   1  2  3  4  5
always frequently occasionally rarely never

5. If I do poorly on a test that I studied hard for, I study in a different way for the next exam in that course.

   1  2  3  4  5
always frequently occasionally rarely never

6. I can predict what college courses will be hard for me.

   1  2  3  4  5
always frequently occasionally rarely never

Participant #_______

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7. When I get a test back, I look up the answers to questions that I missed.

1  2  3  4  5
always frequently occasionally rarely never

8. I can anticipate how hard a test will be for me.

1  2  3  4  5
always frequently occasionally rarely never

9. I purchase study guides, when they are available.

1  2  3  4  5
always frequently occasionally rarely never

10. I only study what is covered in lecture.

1  2  3  4  5
always frequently occasionally rarely never

11. I do as well on tests as I expect to.

1  2  3  4  5
always frequently occasionally rarely never

12. Some study techniques work better than others.

1  2  3  4  5
always frequently occasionally rarely never

13. I underestimate how much time I will need to study for a test.

1  2  3  4  5
always frequently occasionally rarely never

14. I do poorly on exams, even when I feel well prepared.

1  2  3  4  5
always frequently occasionally rarely never
15. For me, different types of tests require different types of study techniques.  
1 2 3 4 5  
always frequently occasionally rarely never

16. If I do poorly on a test, it is because the test is too difficult.  
1 2 3 4 5  
always frequently occasionally rarely never

17. My grade point average (GPA) accurately reflects how much I study.  
1 2 3 4 5  
always frequently occasionally rarely never

18. I find that test questions are very different from what I expected.  
1 2 3 4 5  
always frequently occasionally rarely never

19. I study in different ways for different classes.  
1 2 3 4 5  
always frequently occasionally rarely never

20. I spend more time studying the material that I think my professor will include on the test.  
1 2 3 4 5  
always frequently occasionally rarely never

21. If I do poorly on a test, it is because I did not study long enough.  
1 2 3 4 5  
always frequently occasionally rarely never

22. I look up words that I do not know when I am studying.  
1 2 3 4 5  
always frequently occasionally rarely never
23. Test questions match the material that I study.
   
   1  2  3  4  5
   always frequently occasionally rarely never

24. I can predict what college courses will be easy for me.
   
   1  2  3  4  5
   always frequently occasionally rarely never

25. My studying involves memorizing what is in my course book and/or notes.
   
   1  2  3  4  5
   always frequently occasionally rarely never

26. Even when I study a lot, I do not do well on tests.
   
   1  2  3  4  5
   always frequently occasionally rarely never

27. Cramming for exams is my primary method for studying.
   
   1  2  3  4  5
   always frequently occasionally rarely never

28. I take unplanned study breaks because I get interrupted or distracted.
   
   1  2  3  4  5
   always frequently occasionally rarely never

29. When I do poorly on tests, it is usually in situations in which I realized ahead of time that I was not adequately prepared.
   
   1  2  3  4  5
   always frequently occasionally rarely never

30. I perform better with some types of test questions (i.e., multiple choice, true/false, et cetera) than with other types.
   
   1  2  3  4  5
   always frequently occasionally rarely never
31. I stop studying when I feel like I know the material.
   
   always  frequently  occasionally  rarely  never

32. I like to know how my test grade compares to others in the class.
   
   always  frequently  occasionally  rarely  never

33. I take courses that I think I can do well in.
   
   always  frequently  occasionally  rarely  never

34. My study methods change as it gets closer to the time for the exam.
   
   always  frequently  occasionally  rarely  never

35. If I am doing poorly in a course, I evaluate the approach I am taking and try to find out what I am doing wrong.
   
   always  frequently  occasionally  rarely  never

36. I get discouraged and do not try as hard in a course, after getting a low test grade.
   
   always  frequently  occasionally  rarely  never

37. I only study the course material that I think will be on the test.
   
   always  frequently  occasionally  rarely  never

38. If I do poorly on a test, it is because I did not use good study strategies.
   
   always  frequently  occasionally  rarely  never
39. I meet with my instructors to find out what material will be on tests.

1  2  3  4  5
always  frequently  occasionally  rarely  never

40. After taking the first test in a course, I review the test questions to try to figure out what kinds of things the instructor asks about so that I can study differently for later tests.

1  2  3  4  5
always  frequently  occasionally  rarely  never
60

Participant #

M-C SDS

Please circle the number that corresponds to how well that statement describes you.

1. I like to gossip at times.

   Always
   1  2  3  4
   Never

2. There have been occasions when I took advantage of someone.

   Always
   1  2  3  4
   Never

3. I'm always willing to admit it when I make a mistake.

   Always
   1  2  3  4
   Never

4. I always try to practice what I preach.

   Always
   1  2  3  4
   Never

5. I sometimes try to get even rather than forgive and forget.

   Always
   1  2  3  4
   Never

6. At times I have really insisted on having things my own way.

   Always
   1  2  3  4
   Never

7. There have been occasions when I felt like smashing things.

   Always
   1  2  3  4
   Never
8. I never resent being asked to return a favor.

| Always | 1 | 2 | 3 | Never | 4 |

9. I have never been irked when people expressed ideas very different from my own.

| Always | 1 | 2 | 3 | Never | 4 |

10. I have never deliberately said something that hurt someone's feelings.

| Always | 1 | 2 | 3 | Never | 4 |
DEBRIEFING

The purpose of this study is to develop a new questionnaire that measures the metacognitive component of studying strategies among college students. The metacognitive component refers to one's knowledge of and control over learning situations. Existing study skill questionnaires focus on the methods that study experts feel are most beneficial. This questionnaire will attempt to determine how students make decisions about their study behavior (e.g., what is the best method to use in a certain situation, is the study method being used achieving the desired results). The answers that you provided will assist us in determining if some questions need to be revised or deleted from the final version of the questionnaire.

If you have any questions or concerns regarding this project, you are encouraged to call Tiffney Yeager at 777-3803 or the project advisor, Mark Grabe, Ph.D., at 777-3451.

I would like to thank all of you for participating in this project.
APPENDIX B

QUESTIONNAIRES FOR STUDY TWO

Included in this appendix are copies of the questionnaires used in study two. The materials are in the same order as they were given to the participants. The informed consent form and debriefing form are also included.

(a) informed consent form

(b) informed consent form for follow-up study

(c) Student Consent for Release of Educational Records

(d) Demographic Questionnaire

(e) revised Metacognitive Elements of Study Scale (MESS)

(f) Motivated Strategies for Learning Questionnaire (MSLQ)

(g) debriefing form

(h) debriefing form for follow-up study
INFORMED CONSENT FORM

Name of Project Director: Tiffney Yeager

This experiment is designed to evaluate a new survey of college students' studying strategies. Participants will be asked to complete the new questionnaire, as well as another questionnaire designed to evaluate learning and studying strategies. Participants will also be asked to give written consent for the release of their University of North Dakota Grade Point Average (GPA) and their ACT scores.

I, as a research participant, will be asked to answer a series of questions. This should take approximately 45 minutes. It is highly unlikely that any discomfort will be experienced when completing the questions. To insure strict confidentiality, all information gathered will be kept separate from the names of people who participated in this project and I will be identified by an assigned number only. Furthermore, all obtained GPA's and ACT scores will be kept in a locked cabinet and destroyed after the completion of this study. Only the researcher listed above and her research advisor, Dr. Mark Grabe, will have access to student GPA's and ACT scores.

In return for my participation, I will receive credit as designated by my professor. I am not required to participate in this study, and my decision to participate or decline participation will not prejudice my relations with the University of North Dakota or the Psychology Department. If I decide to participate, I am free to discontinue my participation at any time without penalty or prejudice.

I have read this "Informed Consent Form," and I have been informed of the nature of the potential risks and procedures. At the end of the study, I will be debriefed by the experimenter regarding the goals of the study. Also, I have received a copy of this document for personal reference. Last, I understand that I can call the investigator, Tiffney Yeager, at 777-9921 or the project advisor, Mark Grabe, at 777-3451 if I have any questions regarding this study.

_________________________________________  Age
Participant's Name (printed)

_________________________________________  Date
Participant's Signature

_________________________________________  Date
Witnessed
INFORMED CONSENT FORM

Name of Project Director: Tiffney Yeager

This experiment is designed to evaluate the reliability of a new survey of college students' studying strategies. Participants will be asked to complete the new survey.

I, as a research participant, will be asked to answer a series of questionnaires. This should take approximately 15 minutes. It is highly unlikely that any discomfort will be experienced when completing the questions. To insure strict confidentiality, all information gathered will be kept separate from the names of people who participated in this project and I will be identified by an assigned number only.

In return for my participation, I will receive credit as designated by my professor. I am not required to participate in this study, and my decision to participate or decline participation will not prejudice my relations with the University of North Dakota or the Psychology Department. If I decide to participate, I am free to discontinue my participation at any time without penalty or prejudice.

I have read this "Informed Consent Form," and I have been informed of the nature of the potential risks and procedures. At the end of the study, I will be debriefed by the experimenter regarding the goals of the study. Also, I have received a copy of this document for personal reference. Last, I understand that I can call the investigator, Tiffney Yeager, at 777-9921 or the project advisor, Mark Grabe, at 777-3451 if I have any questions regarding this study.

______________________________  
Participant's Name (printed)  

______________________________  
Participant's Signature  

______________________________  
Witnessed  

Age  

Date  

Date  

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Student Consent To Release
Educational Records

Pursuant to the Family Educational Rights and Privacy Act of 1974, I, _______________, hereby consent to the release by the University of North Dakota of the information concerning my educational records: Cumulative Grade Point Average, Most recent ACT score (if available).

******Parties to whom such records may be released******
(must be completed):

1. _____ Tiffney Yeager _____
2. _____ Mark Grabe, Ph.D. _____

I understand that such records may not be released except on the condition that the party to which the information is being released will not permit any other party to have access to such information without my written consent.

_________________________  _________________________
Signature of Student        Date

_________________________
NAID# or Social Security #

This consent is valid until August 30, 1999.
Participant #

DEMOGRAPHIC QUESTIONNAIRE

1. Gender: Male  Female

2. Age:_________________  3. Year in College:_________________

4. Current Major:___________________
For each of the following statements, circle the number that corresponds to how well that statement describes you.

1. I can predict what kinds of items will be on a test.

   1  
   always
   
   2  
   frequently
   
   3  
   occasionally
   
   4  
   rarely
   
   5  
   never

2. I try to figure out material that confuses me, even if I have to study longer.

   1  
   always
   
   2  
   frequently
   
   3  
   occasionally
   
   4  
   rarely
   
   5  
   never

3. I test myself on the material I am studying.

   1  
   always
   
   2  
   frequently
   
   3  
   occasionally
   
   4  
   rarely
   
   5  
   never

4. If I do poorly on a test that I studied hard for, I study in a different way for the next exam in that course.

   1  
   always
   
   2  
   frequently
   
   3  
   occasionally
   
   4  
   rarely
   
   5  
   never

5. I can predict what college courses will be hard for me.

   1  
   always
   
   2  
   frequently
   
   3  
   occasionally
   
   4  
   rarely
   
   5  
   never

6. When I get a test back, I look up the answers to questions that I missed.

   1  
   always
   
   2  
   frequently
   
   3  
   occasionally
   
   4  
   rarely
   
   5  
   never

7. I can anticipate how hard a test will be for me.

   1  
   always
   
   2  
   frequently
   
   3  
   occasionally
   
   4  
   rarely
   
   5  
   never
8. I do as well on tests as I expect to.
   1 always 2 frequently 3 occasionally 4 rarely 5 never

9. Some study techniques work better than others.
   1 always 2 frequently 3 occasionally 4 rarely 5 never

10. I underestimate how much time I will need to study for a test.
    1 always 2 frequently 3 occasionally 4 rarely 5 never

11. I do poorly on exams, even when I feel well prepared.
    1 always 2 frequently 3 occasionally 4 rarely 5 never

12. For me, different types of tests require different types of study techniques.
    1 always 2 frequently 3 occasionally 4 rarely 5 never

13. My grade point average (GPA) accurately reflects how much I study.
    1 always 2 frequently 3 occasionally 4 rarely 5 never

14. I find that test questions are very different from what I expected.
    1 always 2 frequently 3 occasionally 4 rarely 5 never

15. I study in different ways for different classes.
    1 always 2 frequently 3 occasionally 4 rarely 5 never
16. I look up words that I do not know when I am studying.

always  frequently  occasionally  rarely  never

17. Test questions match the material that I study.

always  frequently  occasionally  rarely  never

18. I can predict what college courses will be easy for me.

always  frequently  occasionally  rarely  never

19. Even when I study a lot, I do not do well on tests.

always  frequently  occasionally  rarely  never

20. Cramming for exams is my primary method for studying.

always  frequently  occasionally  rarely  never

21. I stop studying when I feel like I know the material.

always  frequently  occasionally  rarely  never

22. If I am doing poorly in a course, I evaluate the approach I am taking and try to find out what I am doing wrong.

always  frequently  occasionally  rarely  never

23. I get discouraged and do not try as hard in a course, after getting a low test grade.

always  frequently  occasionally  rarely  never
24. I only study the course material that I think will be on the test.

always   frequently   occasionally   rarely   never

25. I meet with my instructors to find out what material will be on tests.

always   frequently   occasionally   rarely   never

26. After taking the first test in a course, I review the test questions to try to figure out what kinds of things the instructor asks about so that I can study differently for later tests.

always   frequently   occasionally   rarely   never

27. I know my academic strengths and weaknesses.

always   frequently   occasionally   rarely   never

28. I study fewer hours than I plan to.

always   frequently   occasionally   rarely   never

29. If I do poorly in a course, I try to figure out why.

always   frequently   occasionally   rarely   never

30. I am surprised at how difficult courses are.

always   frequently   occasionally   rarely   never
31. My study strategies are inconsistent and unpredictable.

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<tr>
<th></th>
<th>always</th>
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<th>rarely</th>
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32. When I have trouble on a test, I can figure out how to do better on future tests.

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<th>frequently</th>
<th>occasionally</th>
<th>rarely</th>
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MSLQ

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. 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
   not at all true of me
   very true of me

2. If I study in an appropriate ways, then I will be able to learn the material in this course.
   
   1  2  3  4  5  6  7
   not at all true of me
   very true of me

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
   not at all true of me
   very true of me

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
   not at all true of me
   very true of me

5. I believe I will receive an excellent grade in this class.
   
   1  2  3  4  5  6  7
   not at all true of me
   very true of me

6. I'm certain I can understand the most difficult material presented in the readings for this class.
   
   1  2  3  4  5  6  7
   not at all true of me
   very true of me
7. **Getting a good grade in this class is the most satisfying thing for me right now.**

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<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
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<tr>
<td>not at all</td>
<td>very true</td>
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<td>true of me</td>
<td>of me</td>
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8. **When I take a test I think about items on other parts of the test I can't answer.**

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<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>not at all</td>
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9. **It is my own fault if I don't learn the material in this course.**

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10. **It is important for me to learn the course material in this class.**

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

12. **I'm confident I can learn the basic concepts taught in this course.**

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

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 |
    |---|---|---|---|---|---|---|
    | not at all | very true |
    | true of me | of me |

14. **When I take tests I think of the consequences of failing.**

    | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
    |---|---|---|---|---|---|---|
    | not at all | very true |
    | true of me | of me |
15. I'm confident I can understand the most complex material presented by the instructor in this course.

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16. In a class like this, I prefer course material that arouses my curiosity, even if it is difficult to learn.

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17. I am very interested in the content area of this course.

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18. If I try hard enough, then I will understand the course material.

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19. I have an uneasy, upset feeling when I take an exam.

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20. I'm confident I can do an excellent job on the assignments and tests in this course.

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21. I expect to do well in this class.

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22. The most satisfying thing for me in this course is trying to understand the content as thoroughly as possible.

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23. I think the course material in this class is useful for me to learn.

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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.

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25. If I don’t understand the course material, it is because I didn’t try hard enough.

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26. I like the subject matter of this course.

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27. Understanding the subject matter of this course is very important to me.

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28. I feel my heart beating fast when I take an exam.

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29. I'm certain I can master the skills being taught in this class.

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

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
   not at all  very true
   true of me  of me

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
   not at all  very true
   true of me  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
   not at all  very true
   true of me  of me

33. During class time I often miss important points because I'm thinking of other things.

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

34. When studying for this course, I often try to explain the material to a classmate or friend.

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

35. I usually study in a place where I can concentrate on my course work.

   1  2  3  4  5  6  7
   not at all  very true
   true of me  of me
36. When reading for this course, I make up questions to help focus my reading.
   
   not at all 1 2 3 4 5 6 7 very true
   true of me of me

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

38. I often find myself questioning things I hear or read in this course to decide if I find them convincing.
   
   not at all 1 2 3 4 5 6 7 very true
   true of me of me

39. When I study for this course, I practice saying the material to myself over and over.
   
   not at all 1 2 3 4 5 6 7 very true
   true of me of me

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

41. When I become confused about something I'm reading for this class, I go back and try to figure it out.
   
   not at all 1 2 3 4 5 6 7 very true
   true of me of me

42. When I study for this course, I go through the readings and my class notes and try to find the most important ideas.
   
   not at all 1 2 3 4 5 6 7 very true
   true of me of me
43. I make good use of my study time for this course.
   
   1 2 3 4 5 6 7
   not at all very true
   true of me of me

44. If course readings are difficult to understand, I change the way I read the material.
   
   1 2 3 4 5 6 7
   not at all very true
   true of me of me

45. I try to work with other students from this class to complete the course assignments.
   
   1 2 3 4 5 6 7
   not at all very true
   true of me of me

46. Then studying for this course, I read my class notes and the course readings over and over again.
   
   1 2 3 4 5 6 7
   not at all very true
   true of me of me

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
   not at all very true
   true of me of me

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
   not at all very true
   true of me of me

49. I make simple charts, diagrams, or tables to help me organize course material.
   
   1 2 3 4 5 6 7
   not at all very true
   true of me of me
50. When studying for this course, I often set aside time to discuss course material with a group of students from the class.
   
   
   1 2 3 4 5 6 7
   not at all true of me very true of me

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
   not at all true of me very true of me

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
   not at all true of me very true of me

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
   not at all true of me very true of me

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
   not at all true of me very true of me

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
   not at all true of me very true of me
Participant #_____

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
   not at all  very true
   true of me  of me

58. I ask the instructor to clarify concepts I don't understand well.
   1  2  3  4  5  6  7
   not at all  very true
   true of me  of me

59. I memorize key words to remind me of important concepts in this class.
   1  2  3  4  5  6  7
   not at all  very true
   true of me  of me

60. When course work is difficult, I either give up or only study the easy parts.
   1  2  3  4  5  6  7
   not at all  very true
   true of me  of me

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
   not at all  very true
   true of me  of me

62. I try to relate ideas in this subject to those in other courses whenever possible.
   1  2  3  4  5  6  7
   not at all  very true
   true of me  of me

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
   not at all  very true
   true of me  of me
64. When reading for this class, I try to relate the material to what I already know.

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65. I have a regular place set aside for studying.

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66. I try to play around with ideas of my own related to what I am learning in this course.

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67. When I study for this course, I write brief summaries of the main ideas from the readings and my class notes.

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68. When I can't understand the material in this course, I ask another student in this class for help.

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69. I try to understand the material in this class by making connections between the readings and the concepts from the lectures.

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70. I make sure that I keep up with the weekly readings and assignments for this course.

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Whenever I read or hear an assertion or conclusion in this class, I think about possible alternatives. 

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I make lists of important items for this course and memorize the lists. 

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I attend this class regularly. 

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Even when course materials are dull and uninteresting, I manage to keep working until I finish. 

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I try to identify students in this class whom I can ask for help if necessary. 

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When studying for this course I try to determine which concepts I don't understand well. 

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<td></td>
<td>not at all true of me</td>
<td>very true of me</td>
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I often find that I don't spend very much time on this course because of other activities. 

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</table>
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
not at all very true
true of me of me

79. If I get confused taking notes in class, I make sure I sort it out afterwards.

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

80. I rarely find time to review my notes or readings before an exam.

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

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
not at all very true
true of me of me
DEBRIEFING

The purpose of this study is to develop a new questionnaire that measures the metacognitive component of study strategies among college students. The metacognitive component refers to one’s knowledge of and control over learning situations. Existing study skill questionnaires focus on the methods that study experts feel are most beneficial. This questionnaire will attempt to determine how students make decisions about their study behavior (e.g., what is the best method to use in a certain situation, is the study method being used achieving the desired results). The answers that you provided will assist us in determining whether our new questionnaire is actually measuring a unique component that a typical learning strategies questionnaire is not. The questionnaires that you completed will be correlated with your GPA and ACT scores so that we can find out how closely our new test is associated with measures of academic performance and whether our new test, used in conjunction with another questionnaire, enhances the predictive ability of that questionnaire.

We are also asking some participants to return for a short follow-up study in which they will complete the new questionnaire again. The follow-up study is not required, but you will be eligible for additional credit from your instructor if you participate in the follow-up study. If you are interested in participating in the follow-up study, please fill out the lower portion of this form. You may change your mind about participating in the follow-up study at any time and you are not obligated to participate in the follow-up study if you complete the lower portion of this form. You will be provided with another copy of this form to take with you.

If you have any questions or concerns regarding this project, you are encouraged to call Tiffney Yeager at 777-9921 or the project advisor, Mark Grabe, Ph.D., at 777-3451. I would like to thank all of you for participating in this project.

************************************************************************

I, __________________________, would like to be contacted regarding a follow-up study. I understand that if I complete this section of the form, I may later decide not to participate and that this will not prejudice my relations with the University of North Dakota or the Psychology Department. I understand that I will be contacted at the phone number listed below, and that if I choose to participate in the follow-up study, a time will be arranged for my participation.

_______________________________
(Signature)  _______________________
(Date)  
_______________________________
(Phone Number)

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DEBRIEFING

The purpose of this study is to develop a new questionnaire that measures the metacognitive component of studying strategies among college students. The metacognitive component refers to one's knowledge of and control over learning situations. Existing study skill questionnaires focus on the methods that study experts feel are most beneficial. This questionnaire will attempt to determine how students make decisions about their study behavior (e.g., what is the best method to use in a certain situation, is the study method being used achieving the desired results). During this follow-up study, you completed the new questionnaire again. This part of the study is designed to find out if students answer the items on the new questionnaire consistently over time.

If you have any questions or concerns regarding this project, you are encouraged to call Tiffney Yeager at 777-9921 or the project advisor, Mark Grabe, Ph.D., at 777-3451.

I would like to thank all of you for participating in this project.
APPENDIX C

MESS ITEMS AND THEIR CORRESPONDING CONSTRUCT
1. I can predict what kinds of items will be on a test.  
   (Knowledge of Task and Self)

2. I try to figure out material that confuses me, even if I have to study longer.  
   (Knowledge of Alternate Study Strategies)

3. I test myself on the material I am studying.  
   (Knowledge of Alternate Study Strategies)

4. If I do poorly on a test that I studied hard for, I study in a different way for the next exam in that course.  
   (Self-Monitoring)

5. I can predict what college courses will be hard for me.  
   (Knowledge of Task and Self)

6. When I get a test back, I look up the answers to questions that I missed.  
   (Self-Monitoring)

7. I can anticipate how hard a test will be for me.  
   (Knowledge of Task and Self)

8. I do as well on tests as I expect to.  
   (Self-Monitoring)

9. Some study techniques work better than others.  
   (Knowledge of Alternate Study Strategies)

10. I underestimate how much time I will need to study for a test.  
    (Knowledge of Task and Self)

11. I do poorly on exams, even when I feel well prepared.  
    (Knowledge of Task and Self)

12. For me, different types of tests require different types of study techniques.  
    (Knowledge of Alternate Study Strategies)

13. My grade point average (GPA) accurately reflects how much I study.  
    (Self-Monitoring)
14. I find that test questions are very different from what I expected.
   (Knowledge of Task and Self)

15. I study in different ways for different classes.
   (Knowledge of Alternate Study Strategies)

16. I look up words that I do not know when I am studying.
   (Knowledge of Alternate Study Strategies)

17. Test questions match the material that I study.
   (Self-Monitoring)

18. I can predict what college courses will be easy for me.
   (Knowledge of Task and Self)

19. Even when I study a lot, I do not do well on tests.
   (Self-Monitoring)

20. Cramming for exams is my primary method for studying.
    (Knowledge of Alternate Study Strategies)

21. I stop studying when I feel like I know the material.
    (Knowledge of Alternate Study Strategies)

22. If I am doing poorly in a course, I evaluate the approach I am taking and try to
    find out what I am doing wrong.
    (Self-Monitoring)

23. I get discouraged and do not try as hard in a course, after getting a low test grade.
    (Knowledge of Task and Self)

24. I only study the course material that I think will be on the test.
    (Knowledge of Alternate Study Strategies)

25. I meet with my instructors to find out what material will be on tests.
    (Knowledge of Alternate Study Strategies)

26. After taking the first test in a course, I review the test questions to try to figure out
    what kinds of things the instructor asks about so that I can study differently for
    later tests.
    (Self-Monitoring)
27. I know my academic strengths and weaknesses. 
   (Knowledge of Task and Self)

28. I study fewer hours than I plan to. 
   (Knowledge of Task and Self)

29. If I do poorly in a course, I try to figure out why. 
   (Self-Monitoring)

30. I am surprised at how difficult courses are. 
   (Knowledge of Task and Self)

31. My study strategies are inconsistent and unpredictable. 
   (Knowledge of Alternate Study Strategies)

32. When I have trouble on a test, I can figure out how to do better on future tests. 
   (Self-Monitoring)


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