The Relationship Between Academic Self-Efficacy and the Deep Processing Scale of the Inventory of Learning Processes

A Thesis

Presented in Partial Fulfillment of the Requirements for the degree Master of Arts in the Graduate School of the Ohio State University

by

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1992

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To Steve and My Parents
ACKNOWLEDGMENTS

I would like to thank my adviser, Dr. Theodore J. Kaul, for his guidance, his insight, and his encouragement throughout my research. Your knowledge and support have been invaluable in helping me reach this point in my graduate education. I express my sincere appreciation to the other members of my advisory committee, Dr. Lyle Schmidt and Dr. Nancy Betz, for their helpful suggestions and comments. Thanks also go to Dr. Robert Lent, Dr. Steven Brown and Dr. Kevin Larkin for granting me permission to use their academic self-efficacy inventories. I would like to thank my parents for their love and support throughout this endeavor. Finally, to my finance, Steven, thank you for your incredible patience, unshakeable faith, and constructive criticism. I cannot imagine a greater testament of your love for me.
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CHAPTER I
Introduction and Problem Statement

The present study was an investigation of the relationship between academic self-efficacy expectations and the deep processing scale of the Inventory of Learning Processes (Schmeck, Ribich & Ramanaiah, 1977). Research has shown that self-efficacy appears to play a major role in the choice of and persistence in activities (Bandura, 1977). Specifically, researchers have explored the relationship between academic self-efficacy and academic performance and persistence (Betz & Hackett, 1981, 1983; Brown, Lent & Larkin, 1989; Lent, Brown & Larkin, 1984, 1986, 1987). The results of these studies consistently show that academic self-efficacy is an important component in the prediction of academic behavior.

Deep processing is a learning style used by students seeking meaning assimilation. The Inventory of Learning Processes' deep processing scale, like academic self-efficacy, appears to be associated with academic performance, in that students who score higher on this scale are likely to be better students, as measured by grade point average (Schmeck, 1983; Schmeck & Grove, 1979; Gadzella, Ginther & Williamson, 1986a, 1986b, 1987). Of interest in the present study was whether academic self-efficacy and deep
processing as measured by the Inventory of Learning Processes overlap. However, the question traverses similarity and asks whether the deep processing scale of the Inventory of Learning Processes is actually a measure of academic self-efficacy, and if so, how the literature can benefit from this reinterpretation. This question arises from multiple sources. First, the wording of the items of the deep processing scale suggests that it may be a measure of students' beliefs in their ability to use deep processing strategies rather than their actual use of such techniques. Second, studies have shown that high correlations exist between the deep processing scale and constructs like self concept and academic self-efficacy (Gadzella, Ginther & Williamson, 1984, 1986; Meier, McCarthy, & Schmeck, 1984). These strong relationships call into question what exactly the deep processing scale measures. The findings of these studies may simply reveal the important relationships between deep processing and academic self-efficacy as constructs or they may point to the fact that researchers should expect such correlations because they are employing alternative measures of a single construct. If researchers intend to use the Inventory of Learning Processes in their pursuit of factors that explain and predict academic performance, then it is extremely important that the questions surrounding the deep processing scale be answered by methodologically sound research. Thus, the present study was an outgrowth of this
need to understand the deep processing scale in the hopes of making accurate and meaningful interpretations.

According to Bandura (1977) self-efficacy expectations refer to the beliefs we have about our own ability to successfully perform certain tasks. Self-efficacy expectations will, therefore, vary among people as well as tasks to be undertaken. Self-efficacy expectations should not be confused with outcome expectations. Outcome expectations refer to the belief that a certain behavior will produce a particular outcome. Self-efficacy expectations refer to the belief that a certain behavior can be successfully performed regardless of the outcome. Although the difference is important, these constructs are similar in that they both refer to behavior potentiality rather than actual performance. Of interest in Bandura's work (1977) is that self-efficacy, although it refers to expectations, strongly influences performance of and persistence in actual tasks.

Self-efficacy beliefs generally have been operationalized by self-report instruments. These measures consist of a series of items asking questions about an individual's beliefs about the likelihood of being able to successfully perform certain behaviors. Self-efficacy measures for academic behaviors have been constructed by several researchers (Betz & Hackett, 1981, 1983; Lent, Brown, & Larkin, 1984, 1986; Wheelcr, 1983). Betz and Hackett (1981),
constructed a career self-efficacy measure and found career self-efficacy to be a significant predictor of career options. In a later study (Betz & Hackett, 1983) they developed another measure of self-efficacy, this time specifically with respect to mathematics self-efficacy. Their results suggested mathematics self-efficacy was a significant predictor of academic behavior in terms of choice of academic major.

Lent, Brown and Larkin (1984) built on the measure used by Betz and Hackett (1981) in their construction of two academic self-efficacy instruments. The first measured self-efficacy with respect to educational requirements in the science and engineering fields; the second measured self-efficacy with respect to job duties in these fields. The results of the Lent, Brown and Larkin (1984) study suggested academic self-efficacy expectations were powerful predictors of both academic performance and persistence for science and engineering majors.

Lent et al. (1986) developed another measure of academic self-efficacy to assess what they called academic milestones in the science and engineering fields. The focus of the academic milestones measure was on more specific academic behaviors than either of the two previous self-efficacy measures they developed, for example one item asked students to rate their ability to complete the mathematics requirements for most engineering majors while the other
measures simply asked the subjects to indicate their confidence in completing the required education for or job duties of fifteen specified occupations. The results corroborated their earlier findings. Academic self-efficacy was found to be an important predictor of academic behavior in terms of both performance and persistence.

Currently, Lent et al. (1991) are testing their newest self-efficacy measure that assesses global academic self-efficacy. This new instrument expands their focus to students enrolled in all majors. So far no research has been published utilizing this measure but it seems promising for broadening the generalizability of their earlier findings. The current study used this Global Academic Self-Efficacy scale as a building block for the development of an academic self-efficacy instrument. In summary, the Lent et al. studies suggest that academic self-efficacy is an important factor in the prediction of academic performance and persistence.

The importance of self-efficacy as a predictor of career and academic behavior also has been tested by comparing it to other well-established prediction systems (Lent et al., 1987; Wheeler, 1983). Wheeler (1983) compared the self-efficacy model with the expectancy model in terms of occupational preference prediction. The expectancy model predicts occupational preferences by considering the match between an individual's needs and desires for things such as
intellectual stimulation, success, and personal relationships and the availability of particular outcomes in different occupations, such as use of knowledge, opportunity for achievement and social interaction. The more closely the individual's desires match the occupational opportunities the higher is the predicted preference. Self-efficacy theory, on the other hand, predicts occupational preference by determining the individual's belief in his or her ability to be successful in a particular occupation. As self estimations of ability to achieve in a particular occupation increase so does occupational preference. The findings of Wheeler's study suggested that employing a career self-efficacy based prediction system was superior to an expectancy based prediction system.

Lent et al. (1987) explored academic achievement and persistence in science/engineering fields by comparing the academic self-efficacy model with both the interest congruence model and the anticipation of decisional consequences model. The interest congruence model predicts that individuals whose interests match the interests of others in their occupation or academic major will be more likely to remain in that environment and be both satisfied and successful. The decisional consequences model predicts that the greater the number of negative consequences considered before making a decision, the greater the likelihood the decision will remain stable, that is, the
individual will not change his/her mind. The results of Lent et al.'s (1987) study confirmed the superiority of academic self-efficacy over both the interest congruence model and the anticipation of decisional consequences model in explaining unique variance in academic achievement and persistence.

Multon, Brown and Lent (1991) conducted a meta-analytic review of the literature on the relationship between academic self-efficacy and academic behavior. They concluded that across the studies they reviewed, academic self-efficacy appeared to have a substantial effect on academic performance and persistence. Thus, the overall implication of the research reviewed is that academic self-efficacy appears to play an important part in the prediction of academic behavior.

Deep processing is a learning style or a predisposition to use a certain strategy for learning regardless of the demands of a task (Schmeck, 1983). In preparation for a study Schmeck (1983) reviewed the literature on learning styles and described a number of researchers who had identified specific styles of learning. His review included: Pask's (1976a, 1976b) holistic and serialist strategy; Marton and Saljo's (1976a) deep level approach and surface level approach; Entwistle, Hanley and Hounsell's (1979) meaning orientation, reproducing orientation and achieving orientation; and Biggs' (1979) utilizing, internalizing, and achieving strategies. Schmeck, Ribich and Ramaiah (1977)
used some of these precursors to aid in the development of the Inventory of Learning Processes. The original 121 items for this inventory were specified by a group of experts who developed the list of items from human learning and memory processes uncovered by the previous research or advocated by major theories. This list was given to 503 college students and the results were subjected to a principal components factor analysis. The final inventory contained 62 items grouped into four scales. These scales represented approaches to studying and shared common names with these approaches. The four scales were deep processing, elaborative processing, fact retention and methodical study. The present research focused on the deep processing scale which Schmeck et al. characterized as consisting of both the critical evaluation and conceptual organization of information to be learned. Schmeck et al. (1977) reported adequate psychometric data for the Inventory of Learning Processes' scales, test-retest reliabilities for a two week interval ranging from .79 to .88 and internal consistencies ranging from .58 to .82. In particular, the deep processing scale had a test-retest reliability of .88 and an internal consistency reliability of .82. Thus, they concluded that the Inventory of Learning Processes was a methodologically sound instrument.

Schmeck and Grove (1979) and Schmeck (1983) both reported a relationship between the deep processing scale of the
Inventory of Learning Processes and academic performance such that high achieving students had significantly higher scores on this scale than low achieving students. Gadzella, Ginther, and Williamson (1986b) replicated Schmeck's (1983) study and found their results supported the direct relationship between the deep processing scale and academic achievement found in Schmeck's work. Likewise, Miller, Alway and McKinley (1987) found that students with high grade point averages (GPA) scored significantly higher on the deep processing scale than students with average or low GPAs. All of these studies support the hypothesis that the deep processing scale of the Inventory of Learning Processes may be an important component in systems predicting academic performance.

Both academic self-efficacy and the deep processing scale of the Inventory of Learning Processes appear to predict academic behavior. The question addressed by the present study was whether the deep processing scale of the Inventory of Learning Processes is actually measuring deep processing, or if it is in fact a measure of academic self-efficacy. It is important to note that the measurement of these constructs was questioned and not the validity of the constructs themselves. Deep processing and academic self-efficacy were assumed to be separate constructs; however, which of these was measured by the deep processing scale of the Inventory of Learning Processes was questioned.
The validity of this scale was called into question based on several factors. First, most of the questions making up this scale appear to address academic self-efficacy beliefs rather than actual use of deep processing techniques (for example, "I have trouble organizing the information that I remember", "I have trouble making inferences", "I have difficulty planning work when confronted with a complex task", and "I have difficulty learning how to study for a course"). These questions seem to investigate a student's belief in his/her ability to perform certain tasks successfully rather than his/her attempts to accomplish those tasks. Furthermore, studies have shown that positive correlations exist between the deep processing scale and self concept, a measure related to self-efficacy (Gadzella, Ginther, & Williamson, 1984, 1986), as well as between deep processing scores and academic self-efficacy itself (Meier, McCarthy & Schmeck, 1984). Gadzella, Ginther, and Williamson (1986b) found deep processors (as measured by the Inventory of Learning Processes) had significantly higher self concepts than shallow processors. They concluded that a student's view of self determines, in part, how he/she processes information. Alternatively, their results could be considered support for the hypothesis that the deep processing scale of the Inventory of Learning Processes measures academic self-efficacy, a construct related to self-concept.
Meier, McCarthy and Schmeck (1984) proposed that writing performance would be highly affected by academic self-efficacy which in turn would be associated with how a student cognitively processed information. To investigate this hypothesis Meier et al. utilized the Inventory of Learning Processes, a measure of self-efficacy for writing and actual writing samples. Students' cognitive processing level was determined using a combined deep processing and elaborative processing score from the Inventory of Learning Processes. Their results indicated that this combined score served as a significant predictor of academic self-efficacy strength which in turn predicted writing performance. Meier et al. concluded that deep and elaborative cognitive processing helps students develop strong academic self-efficacy. It is possible, however, that the relationship between these constructs is due to the fact that the deep processing scale of the Inventory of Learning Processes measures academic self-efficacy. The results of the previous two studies suggest a relationship between the two measures that may go beyond the explanation that deep processors simply tend to be more self-efficacious with respect to academics. It may be that positive correlations should be expected because we are looking at two separate measures of the same construct.

The present study utilized three instruments, the Inventory of Learning Processes, a measure of academic
self-efficacy, and the Approaches to Studying Inventory (Entwistle & Ramsden, 1983). Specifically, the relationship between the deep processing scale of the Inventory of Learning Processes and the academic self-efficacy measure was compared to the relationship between the deep processing scale and the meaning orientation scale of the Approaches to Studying Inventory, which served as an independent measure of deep processing. The purpose of this comparison was to establish what construct the deep processing scale was measuring.

Entwistle and Ramsden's Approaches to Studying Inventory (1983) contains four general orientations to studying, however, only the meaning orientation was utilized because it is conceptually similar to Schmeck et al.'s characterization of the deep processing scale. This orientation is made up of four subscales labeled deep approach, use of evidence, intrinsic motivation, and relating ideas. Entwistle and Ramsden suggested that it measures students' intentions to assimilate meaning, relate new information to what is already known, search for supporting evidence and be driven by inherent interest in academic topics. Many of these same characteristics were described by Schmeck et al. as components of the Inventory of Learning Processes' deep processing scale. The psychometric data reported by Entwistle and Ramsden (1983) for the meaning orientation appears to be acceptable, internal consistency equaling .79.
Unlike the items in the Inventory of Learning Processes, the items making up the meaning orientation scale of the Approaches to Studying Inventory do appear to measure student's actual execution of certain deep processing tasks rather than their beliefs or expectations about performing these tasks (for example, "I often find myself questioning things that I hear in lectures or read in books", and "When I'm tackling a new topic, I often ask myself questions about it which the new information should answer"). Based on this the Approaches to Studying Inventory appears to be an adequate independent measure of deep processing.

The academic self-efficacy measure was created for this particular study based on Lent et al.'s (1991) Global Academic Self-Efficacy Scale. The measure consists of 56 items asking students to assess their confidence with respect to completing specific academic requirements. The questions were developed from institutional guidelines concerning general academic requirements that must be fulfilled by all students in order to graduate. Because this instrument was developed for the present study, tests were conducted to determine its psychometric properties as part of the data analysis.

The specific hypothesis evaluated in this study was derived from the assertion that the deep processing scale of the Inventory of Learning Processes may be more a measure of academic self-efficacy than deep processing. Based on this
it was predicted that a significant positive correlation between the measure of academic self-efficacy and the deep processing scale of the Inventory of Learning Processes would be found. In order to meaningfully interpret this hypothesis two other predictions had to be investigated. These two checks were necessary to establish the importance of any relationship found between the measure of academic self-efficacy and the deep processing scale of the Inventory of Learning Processes. The first check evaluated the relationship between the deep processing scale of the Inventory of Learning Processes and an independent measure of deep processing (the meaning orientation scale of the Approaches to Studying Inventory). A non-significant relationship was predicted. Support for this check would suggest that the deep processing scale of the Inventory of Learning Processes was indeed measuring something other than the deep processing construct. The second check was designed to investigate a possible alternative explanation for the finding of a relationship between the academic self-efficacy measure and the deep processing scale of the Inventory of Learning Processes. It would be possible to explain a relationship between the scales by suggesting that academic self-efficacy and deep processing were, in fact, different names for the same construct. In other words, a relationship between the deep processing scale and the academic self-efficacy scale may indicate a definitional problem
rather than a measurement problem. In order to eliminate this alternative explanation the second check predicted a non-significant correlation between the meaning orientation scale of the Approaches to Studying Inventory and the measure of academic self-efficacy. Data supporting this check would indicate that academic self-efficacy and deep processing were indeed separate constructs, otherwise, any measure of deep processing would be related to the academic self-efficacy scale.

If the hypothesis and the checks were confirmed it would suggest that the deep processing scale of the Inventory of Learning Processes may be a measure of academic self-efficacy, but the distinction between deep processing as a construct and academic self-efficacy as a construct would be maintained. This is crucial because the hypothesis only questioned the validity of the deep processing scale of the Inventory of Learning Processes as a measure of deep processing and not the concept of deep processing itself.

The results of the present study may be important for three basic reasons. First, researchers employing the Inventory of Learning Processes need to know what exactly they are measuring because the interpretation of findings remains in jeopardy as long as the construct validity of the Inventory of Learning Processes' scales remains unclear. Second, if the deep processing scale of the Inventory of Learning Processes is indeed a measure of academic
self-efficacy then it would behoove researchers exploring academic prediction through either the Inventory of Learning Processes or academic self-efficacy to recognize that in some ways their pursuits are the same. By combining their research efforts and using the two bodies of literature as a single base, their endeavors would advance more quickly and with greater foundation. Finally, the results are important because the distinction between deep processing as a construct and instruments that actually measure deep processing is important if researchers hope to determine what it is that best predicts both performance and persistence in academics.
CHAPTER II

The Selected Literature

To understand the relevance of the present study it is necessary to have knowledge of the development of self-efficacy theory and its relationship to academic and career behavior. This will be the focus of the first part of the review. Also important is the development of the learning styles literature with particular emphasis on the Inventory of Learning Processes and the relationship between the deep processing scale and academic behavior. The second half of the review will outline this development and will also make connections between the two bodies of literature where pertinent.

Self-efficacy expectations refer to the belief that one has the ability to successfully perform a specific behavior. In other words, it is the individual's subjective answer to the question "Can I do this?" Bandura (1977) proposed that these self-efficacy expectations influence two major components of behavior. First, they appear to be related to the initiation or choice of behavior and second, they are linked to persistence or the coping efforts expended by the individual after initiation has taken place. Self-efficacy expectations differ from outcome expectations in that outcome expectancy refers to an individual's belief that a given
behavior will lead to a certain outcome. Thus, even if an individual expects a particular outcome to be the consequence of a certain behavior, the likelihood of performing this behavior will go unchanged unless the individual believes the ability factor is present as well. This is not to say however, that self-efficacy alone influences behavior. Bandura specifically stated that both appropriate skills and incentives are necessary prerequisites of performance. Given these, self-efficacy does appear to play a major role in the choice of activities as well as the amount and duration of effort expended.

It is important to note that the connection between self-efficacy and performance, in terms of activity choice and energy expenditure, is a bidirectional one. In general, self-efficacy expectations influence performance and the outcome of these performance efforts will, in turn, affect self-efficacy in either negative or positive ways.

There are exceptions to this rule of reciprocity. A distinction must be drawn between information contained in environmental events and information as processed and transformed by the individual. The individual processor takes into account social, situational, temporal, and other information that may either negate or enhance the affect of successful or unsuccessful experiences on self-efficacy expectations. In other words, successful performance does not always translate into increased self-efficacy.
expectations and performance failure does not always mean reduced self-efficacy expectations. Other information processed simultaneously with performance will mediate its effect and determine whether a person's beliefs about self are influenced by or separated from the situation. This is important because one of the implications of the present study is academic behavior prediction. Realizing that self-efficacy expectations are affected indirectly by all the information a person processes helps to clarify the limitations of this implication. Thus, we would expect a significant positive correlation between successful academic performance and high academic self-efficacy but situations could be construed in which this would not be the case.

Keeping this "person as processor" model in mind, Bandura (1977) proposed performance accomplishments, vicarious experiences, verbal persuasion, and emotional arousal as the four general sources through which self-efficacy is developed. As previously discussed, performance accomplishments, which refer to direct mastery experiences, are a powerful source of self-efficacy. In fact, Bandura suggested that performance accomplishments were the most important of the four sources. Bandura (1977) reviewed research which reported that clients involved in direct mastery experiences with feared stimuli increased their approach behavior and their self-efficacy expectations significantly more than clients in conditions where they
observed models interacting with feared stimuli. These studies supported the hypothesis that performance experiences affected future behavior and suggested that self-efficacy may have been the mediating link. The second source of self-efficacy is vicarious experience. Bandura (1977) reported that seeing others perform without suffering aversive consequences increased self-efficacy expectations. Verbal persuasion also contributed to the development of self-efficacy beliefs, but its effects were weaker than either of the first two sources and consequently, more susceptible to change (Bandura, 1977). Finally, emotional arousal was considered to be related to self-efficacy expectations because people gauge their vulnerability to stress and failure in part by assessing their physiological arousal level. Individuals who attributed emotional arousal to anxiety or other aversive states, decreased their expectations for success and were less likely to engage in a particular behavior. On the other hand, if emotional arousal was interpreted as related to positive states the person was more inclined to attempt or continue with certain behaviors because their expectations for success were elevated.

The four sources of self-efficacy are important because they allow us to understand, at least in part, how a student's academic self-efficacy develops. They also suggest areas of intervention for influencing students' academic self-efficacy. If researchers can use this information to
enhance academic self-efficacy the consequence may be improved academic behavior.

Bandura's work on self-efficacy theory has focused primarily on the influence of self-efficacy expectations on treatment outcomes with clients suffering from phobias. It is quite a jump, therefore, to assume increased academic self-efficacy may affect something so diverse as academic behavior. Luckily, other researchers have not just accepted this assumption but have scientifically extended Bandura's theory to the areas of academic achievement and persistence as well as career behavior through methodologically stringent research. In a theoretical paper, Hackett and Betz (1981) proposed that differential occupational self-efficacy beliefs between men and women were directly related to women's underutilization of their talents and capabilities in career pursuits. They described how socialization may induce unequal access to the four sources of self-efficacy beliefs and may result in women being less self-efficacious than men with respect to occupations. Based on self-efficacy theory, lower occupational self-efficacy expectations may cause women to underutilize their talents and capabilities in career and academic pursuits by restraining the types of tasks women attempt and their persistence once a task is initiated.

Betz and Hackett (1981) published a study in which they reported significant and consistent sex differences in occupational self-efficacy with respect to traditional and
nontraditional occupations. Men's occupational self-efficacy scores were equivalent for both categories of occupations while women scored significantly lower on nontraditional occupations. These results are suggestive in that male and female ability levels were not significantly different on an objective measure of ability (ACT score). In other words, even though men and women possessed roughly the same capabilities and talents, because women had lower self-efficacy expectations than men with regard to these talents they acted as if the talents did not exist. Overall, occupational self-efficacy beliefs and interests were the strongest predictors of the perceived range of career options. This study supported the hypotheses that occupational self-efficacy was significantly related to occupation choice, and that gender differences in occupational self-efficacy were predictive of gender differences in perceived occupational options. The research is limited, however, by both the restricted number of occupational titles tested and the failure to provide adequate reliability and validity data on the occupational self-efficacy measure developed. Betz and Hackett's findings are important in that academic behavior and career behavior are intimately related. Their findings suggested that occupational self-efficacy was a predictor of perceived career options. Because of the relationship between career and academic behavior, occupational self-efficacy may also be
important for predicting academic behavior. This possibility led Betz and Hackett to explore the relationship between self-efficacy and academic behavior in the form of academic major choice.

In their further exploration of self-efficacy, Betz and Hackett (1983) looked more specifically at mathematics self-efficacy expectations and their relationship to the selection of science-based college majors. They hypothesized that men would have stronger expectations than women and that these mathematics self-efficacy expectations would be related to career decision making in the form of selection of science majors. A mathematics self-efficacy scale was developed and adequate reliability data were provided, however, Lent and Hackett (1987) fault the measure's short math problem scale as a limit to its generalizability. The results confirmed the hypotheses, in that females had significantly weaker math self-efficacy than males, and that higher math self-efficacy was related to increased likelihood of selecting a science major. This finding is especially important because men and women's actual mathematics ability was not a significant contributor to the prediction of which students would choose science majors. One explanation of this finding is Hackett and Betz's earlier proposition that limited exposure to the sources of self-efficacy discriminates against women. In summary, Betz and Hackett found significant relationships between self-efficacy and both career and academic behavior.
Their results suggested the importance of academic self-efficacy in academic performance prediction. Other researchers have corroborated and extended Betz and Hackett's work by looking at both academic performance and persistence.

Lent, Brown, and Larkin (1984, 1986, 1987, and Brown, Lent & Larkin, 1989) built on the measures developed by Betz and Hackett (1981) in their consideration of the relationship between academic self-efficacy expectations and academic achievement and persistence. They looked specifically at students considering science and engineering fields and developed academic self-efficacy measures accordingly. In their 1984 study they developed two measures of self-efficacy, one assessing self-efficacy expectations with regard to educational requirements, the other with regard to job duties. These measures were entitled the Self-Efficacy for Technical/Science Fields for Educational Requirements Measure and the Self-Efficacy for Technical/Science Fields for Job Duties Measure, respectively. The academic self-efficacy inventories measured two aspects of academic self-efficacy: level, which referred to a student's positive or negative expectations about whether they could successfully complete a specific requirement or duty, and strength, or confidence in their level response. Thus, Lent et al. obtained data indicating not only if a subject believed he/she could successfully complete the educational requirements or job duties for a particular major, such as
chemistry, but also their confidence in this yes/no answer. Both instruments assessed only the science and technical fields of study. The psychometric data provided by Lent et al. suggested adequate stability, internal consistency and interrelatedness of the instruments. The test-retest reliabilities over an eight week period ranged from .59 to .89 and coefficient alphas ranged from .79 to .89. The correlation between the educational requirements self-efficacy strength and level measures was .81 and the correlation between the job duties self-efficacy strength and level measures was also .81.

The results of Lent et al.'s study (1984) supported the hypothesis that students with higher academic self-efficacy would achieve higher grades and more persistence in the technical majors (as measured by number of quarters in technical majors at one year follow up) than students with low academic self-efficacy beliefs. Interestingly, Lent et al. found no gender differences in perceived ability with respect to technical/science areas. In fact, academic self-efficacy scores were significantly correlated with math PSAT scores and high school ranks, two objective measures of ability. These results run counter to Betz and Hackett's findings (1981, 1983). The discrepancy between findings may be the result of Lent et al.'s limited sample and the fact that the selection criterion to be enrolled in the college of sciences in the university where the study was conducted was
quite high. Besides the limited external validity due to the selective sample, the study can also be criticized for a lack of instrumental validity data. The authors themselves suggested the possibility that their measures operationalized self confidence or certainty of career choice rather than academic self-efficacy. A third problem with the study involves the apparent redundancy of the level and strength measures of academic self-efficacy. Lent et al. included both level and strength measures in order to be consistent with earlier work by Bandura and his colleagues (Bandura, 1977; Bandura, Adams, Hardy, & Howells, 1980). In their studies Bandura et al. investigated the relationship between self-efficacy expectations and phobias. Level and strength measures were, therefore, appropriate because tasks could be arranged in a hierarchical order such that level and strength scores provided related but unique information about a subject’s self-efficacy. Because the tasks involved in Lent et al.'s study could not meaningfully be placed on a hierarchical continuum, the level measure served only as a crude measure of strength, providing no unique information in and of itself. Therefore it was unnecessary and, in fact, disregarded in later studies. Although Lent et al.'s study has limitations, the results suggested that academic self-efficacy was a powerful predictor of academic performance and persistence for science and engineering majors and a construct worth pursuing for researchers
interested in developing academic behavior prediction models.

In their 1986 study, Lent et al. chose to use only the Self-Efficacy for Technical/Science Fields for Educational Requirements measure developed in their earlier study. They also developed a new measure, entitled Strength of Self-Efficacy for Academic Milestones. This instrument measures student's confidence in their ability to successfully perform specific tasks required for science/engineering majors. Thus, whereas the Educational Requirements Measure asks students to rate their confidence in successfully completing the required education for specific majors, such as agricultural engineering, the Academic Milestones Measure asks about specific academic requirements for most science majors, such as a student's confidence in his/her ability to successfully complete the physics requirements for most science majors. The psychometric data provided for this new academic self-efficacy measure show high internal consistency and only moderate relatedness to the Self-Efficacy for Technical/Science Fields for Educational Requirements measure, suggesting the two are related but measure different aspects of academic self-efficacy. Other improvements in this study included eliminating the level of academic self-efficacy score and using only the strength of academic self-efficacy score due to the aforementioned redundancy.
The results replicated their earlier study, again no sex differences were found and students with higher academic self-efficacy had significantly higher grades and persistence in the field. By using a hierarchical regression analysis the researchers found academic self-efficacy contributed unique variance in predicting technical/science grade point average beyond that accounted for by objective measures of ability (PSAT score and high school rank.) For predicting number of quarters remaining in technical/science majors, academic self-efficacy was the only significant contributor. Lent et al. (1986) also included measures of self esteem and career indecision. The nonsignificant correlations between academic self-efficacy and these measures suggested academic self-efficacy was distinct from self confidence and career choice certainty. This study lent further credence to the importance of academic self-efficacy expectations in the prediction of academic behavior because it not only replicated the earlier results but it also accounted for several of the earlier limitations.

Through this early work, the self-efficacy model gained strength as a major component in predicting career and academic behavior. To further this end, two studies have compared the self-efficacy model with other well-established prediction systems. Wheeler (1983) compared the expectancy model with the occupational self-efficacy model. The expectancy model explains occupational preference and
consequently, academic major choice, as a function of the individual's need and desire for certain outcomes found in particular occupations, such as achievement and social relations. The expectancy model will therefore, take into consideration the individual's needs and desires as well as the availability of particular outcomes in different occupations and use this information to predict an individual's choice. Self-efficacy theory, on the other hand, predicts low self-efficacy for certain occupations will diminish occupational preference, and high occupational self-efficacy will enhance it. Therefore, the self-efficacy model of occupation and academic major choice does not include individual components such as desirable outcomes as main sources of prediction. Even if an outcome is considered desirable, if the individual does not believe he/she has the ability to achieve it through successful performance it is unlikely he/she will pursue it. According to self-efficacy theory, the best way to predict what an individual will pursue is to identify what he/she believes can be successfully accomplished. The instruments used to measure expectancy in Wheeler's study came from previous research, whereas the occupational self-efficacy measures were developed for the study. Wheeler reported test-retest reliability data between .73 and .77 over an eight week interval for these measures suggesting adequate psychometric properties. Results supported the hypothesis that both
models were significantly related to occupational preference and that the relationships between occupational preference and the two models were independent of one another. Further, Wheeler found that of the two models occupational self-efficacy (when operationalized as ability match) was the stronger predictor. He also found sex differences with respect to occupational choice such that male dominated occupations were perceived as more difficult than female dominated occupations by both sexes and that females' occupational preference was significantly more affected by this in a limiting way than males' occupational preference. This restricted occupational choice was significantly related to occupational self-efficacy expectations. Wheeler concluded that as Betz and Hackett (1981) proposed, low occupational self-efficacy expectations lead women to underestimate and therefore underutilize their talents which results in perpetuation on stereotypic occupational roles. These, in turn influence the occupational self-efficacy expectations of the next female generation. Correctly perceiving abilities to successfully perform occupational requirements is an essential step to helping women break free of this never ending cycle. In summary, Wheeler's findings support previous research in suggesting differences in occupational self-efficacy between males and females and in emphasizing the importance of occupational self-efficacy in any occupational prediction system. Occupational
self-efficacy was identified as a crucial component, however Wheeler's results suggest that a more complete model of occupational preference would also include components of expectancy theory.

The second study (Lent et al., 1987) compared the occupational self-efficacy model to the interest congruence model (Holland, 1985 as cited by Lent et al., 1987) and the anticipation of decisional consequences model (Janis & Mann, 1977, 1982 as cited by Lent et al., 1987). Holland's congruence model predicts that vocational stability and achievement are the result of person environment congruence. In other words, the more closely an individual's interests match with interests of others in his/her occupation or academic major, the greater the likelihood that he/she will remain in the occupation/major and do well. Janis and Mann's decision model predicts that the persistence of decisions will be positively related to the number of consequences generated before making a decision, especially the number of negative consequences. Thus, the more negative consequences an individual identifies about making a decision before it is made, the greater the likelihood that he/she will stick with the decision. This persistence is partly because awareness of potential negative consequences helps inoculate the person against them. For predicting academic achievement and persistence only the occupational self-efficacy model added unique predictive variance. For range of perceived career
options, both occupational self-efficacy and congruence added significant variance. Finally, in predicting career indecision, only congruence added unique variance. Thus, occupational self-efficacy seems to be most important as a predictor of grades and retention in technical majors. The implications of this study are limited however, by two main problems. First, the use of the science/engineering majors restricts generalizability beyond this student subgroup. Second, the operationalization of both congruence and consequences is questionably valid. The index of congruence may not have been sensitive enough to accurately assess person-environment fit and the environments associated with each academic major were inferred from previous data rather than assessed directly. In terms of consequences, the measure used by Lent et al. was less sophisticated than that suggested by Janis and Mann which may have affected the measure's validity. Even with these limitations, the results confirmed that occupational self-efficacy was an important part of models attempting to predict academic behavior.

In a recent study Brown, Lent and Larkin (1989) explored the possible interaction of academic self-efficacy and aptitude. They were interested in determining if academic self-efficacy had differential effects on low versus high aptitude students. They measured academic self-efficacy with both the Self-Efficacy for Technical/Science Fields for Educational Requirements measure (1984) and the Strength of
Self-Efficacy for Academic Milestones measure (1986). Their results suggested that high aptitude students acted independently of their educational requirement self-efficacy strength, whereas low aptitude students were facilitated in performance and persistence by high educational requirement self-efficacy strength. The academic milestone self-efficacy strength influenced performance and persistence across all aptitude levels, facilitating positive outcomes when academic self-efficacy was high. These results lend further credence to the notion that these two self-efficacy measures are tapping into distinct aspects of academic self-efficacy. Perhaps the difference lies in the amounts of past experience students have had with the underlying aspects of academic milestones versus educational requirements. Academic milestones may tap into areas in which students have had more direct experience and therefore, more opportunity to develop academic self-efficacy estimations. In contrast, educational requirements may be more global, future oriented expectations involving little prior experience and little concrete basis for academic self-efficacy beliefs. This explains why the operationalization of academic self-efficacy mediated its relationship with academic performance and persistence and allows the authors to conclude that students' self-efficacy beliefs concerning academic skills are indeed related to scholastic aptitude.
Currently, Lent et al. (1991) have developed a measure that assesses global academic self-efficacy. This 12 item scale is appropriate for students in any field of study unlike the previous measures which have been limited to science/engineering majors. This instrument assesses academic self-efficacy with respect to the general educational requirements of the university. In other words, it rates students' confidence in their ability to successfully accomplish certain tasks that are required of all students at the university such as arts and humanities requirements or written communication requirements. No data are yet available as to the measure's validity or reliability and no studies have been completed with this instrument. However, in light of the similarity in construction of the instrument to previous scales, research using this measure seems promising. It should help clarify academic self-efficacy's influence on academic performance and alleviate one of the main problems with Lent et al.'s previous research. By utilizing more representative college populations this scale should increase the generalizability of findings and consequently, their practical value.

In summary, Multon, Brown, and Lent (1991), in a meta-analytic review of the literature, assessed the available data on academic self-efficacy and its relation to academic outcomes. Their results supported the hypotheses that academic self-efficacy facilitates both academic
performance and persistence. Across studies, academic self-efficacy accounted for 14% of the variance in performance and 12% of the variance in persistence. Effect size estimates were heterogeneous suggesting that the academic self-efficacy/academic behavior relationship may vary across student types (high versus low achievers), academic self-efficacy measures (standardized tests versus classroom behavior and basic skills tasks), and study characteristics (posttreatment measures versus pretreatment and correlational studies). Although the studies reviewed by Multon et al. differ in effect size they seem to agree at least on a general level that academic self-efficacy has a substantial effect on academic behaviors in terms of both performance and persistence.

The previous studies have supported the hypothesis that academic self-efficacy has a considerable effect on academic behavior. The next section of this literature review looks at the research on learning styles with particular emphasis on the deep processing style as measured by the Inventory of Learning Processes and its relationship to academic performance. Also, some preliminary connections are drawn between the learning styles and academic self-efficacy literatures.

A learning style is a predisposition to adopt a particular strategy or pattern of information processing, regardless of the specific demands of the learning task.
(Schmeck, 1983). In his review of the literature, Schmeck (1983) described many researchers who had attempted to identify specific learning styles. Pask (1976a, 1976b; Pask & Scott, 1971) proposed both a holist strategy, involving comprehension learning and a global approach to multiple tasks and goals; and a serialist strategy, involving linear progression through a single task with attention paid to details. Pask also emphasized that the most competent student was the one who employed both strategies in what Pask labeled a versatile learning style.

Marton and Saljo (1976a, 1976b) conceptualized two approaches to learning. The first was a deep level approach and was conclusion oriented. Students who used this approach were concerned with summarizing ideas and understanding important points. Their main focus was to understand the big picture or how the ideas they were learning fit together to form a whole. Thus, this approach was similar to Pask's holistic strategy. The other approach was a surface level one focusing on details and memorization. Students who used this approach cared about knowing the facts and were less concerned with how they fit together. The focus on details made this approach similar to Pask's serialist strategy.

Entwistle, Hanley and Hounsell (1979) identified three student orientations to learning. Those using a meaning orientation searched for personal understanding and were motivated intrinsically, thus they were inclined to use an
approach that emphasized deep rather than surface understanding. In contrast to the meaning orientation student, the reproducing orientation student relied on a surface approach involving rote memorization and extrinsic motivation. Finally, the achieving orientation referred to those students who did whatever was necessary to get a good grade. Like the reproducing orientation students these students were extrinsically motivated. Unlike the reproducing orientation students, however, the achieving orientation students were flexible about the depth to which they processed information. If they could achieve a high grade through rote memorization this was all they used. On the other hand, if they deemed it necessary to use a deep level approach in order to earn a high grade these students were able to switch gears and process for a deeper understanding.

Other researchers looked at learning styles and strategies by way of inventories assessing student's approaches to learning. Biggs developed the Study Processes Questionnaire (SPQ, 1970, 1979, 1984) and identified three separate learning strategies through a factor analysis. The three factors produced by the analysis were labeled utilizing, internalizing and achieving. Utilizing was basically a memorization strategy corresponding to Entwistle et al.'s reproducing orientation, Marton and Saljo's surface approach and Pask's serialist strategy. Internalizing
involved meaning assimilation and required a deep level approach like that employed in Pask's holist strategy, Marton and Saljo's deep level approach and Entwistle et al.'s meaning orientation. Achieving referred to a study skills and organization orientation. Students who used this approach were extremely methodical in their study habits. They tended to do things like study at the same time and in the same place each day and conduct regular reviews of the material they were trying to learn. Unlike the first two strategies, this approach was not identified by other researchers. It is important to know the different conceptualizations of approaches to learning because the inventory used in the present study, the Inventory of Learning Processes (Schmeck, Ribich & Ramanaiah, 1977), was built upon this background. Likewise, The Approaches to Studying Inventory (Entwistle & Ramsden, 1983), the instrument used as an independent measure of deep processing in the present study, was developed from this research base.

Schmeck, Ribich, and Ramanaiah (1977) developed the Inventory of Learning Processes as a measure of learning styles. Based on a factor analysis they uncovered four dominant scales representing four different approaches to learning. These four scales supported and incorporated the ideas proposed by earlier research. They were: deep processing, elaborative processing, fact retention and methodical study. Schmeck et al. characterized the deep
processing scale as measuring a student's use of critical evaluation, conceptual organization, contrast and comparison, and meaning assimilation during the learning process. The basic strategy of deep processors was to move from a specific to a general understanding of meaning. Thus, it was important to these students to get an idea of how the details they learned built up into the big picture. This scale holds much in common with Marton and Saljo's deep level approach.

The elaborative processing scale of the Inventory of Learning Processes was similar to the deep processing scale in that they both assessed meaning assimilation. They differed in that elaborative processing involved searching for personal meaning and examples, putting ideas in the individual's own words and using visual imagery. Elaborative processors progressed from the general to the specific, that is, they started with an overall understanding and attempted to dissect it into its individual components. They took the opposite approach to that used by deep processors.

The fact retention scale of the Inventory of Learning Processes was strikingly reminiscent of Entwistle et al.'s (1979) reproducing style, Pask's (1976) serialist strategy, Marton and Saljo's (1976a) surface level approach and Biggs' (1979) utilizing strategy. The intent of students who used fact retention was to process details through memorization. The focus on specific factual information resulted in these students doing well on tests asking for facts, dates, etc.
Finally, the methodical study scale of the Inventory of Learning Processes was similar to Biggs' achieving factor in that it referred to students who employed study skills techniques and who studied more often and more carefully than others. Thus, Schmeck et al.'s work suggested that students fall for the most part into one of these four categories and that by knowing how an individual approaches studying researchers can identify the kinds of tasks at which a student will excel.

Schmeck et al. (1977) ran psychometric data on their inventory to examine its validity and reliability. The numbers they reported suggest the Inventory of Learning Processes has adequate psychometric properties for the most part but may retain some unresolved problems. The internal consistencies for the scales were adequate, ranging from .79 to .88. The intercorrelations between scales suggested some overlap, especially between the deep processing and elaborative processing scales. Even so, Schmeck et al. argued that because these scales had differential validity they were indeed separate approaches and therefore, merited distinct scales. Later on, however, Schmeck (1983) indicated that combining deep processing and elaborative processing was acceptable in some research situations. His reasoning is unclear, however, if indeed these are separate approaches to learning. The uncertainty that continues to surround the deep processing and elaborative processing scales of the
Inventory of Learning Processes may be cleared away if the deep processing scale is found to be a measure of academic self-efficacy.

The Inventory of Learning Processes has been the focus of many studies since its creation, mostly in terms of its function as a predictor of academic success. Schmeck and Grove (1979) found significant differences in the Inventory of Learning Processes profiles of high and low achieving students, as measured by GPA and ACT scores. The high achievers were significantly higher on deep processing, elaborative processing and fact retention. Their results suggested that the good student used deep and elaborative processing but not to the exclusion of facts and details. Schmeck and Grove used path analysis in order to determine the independence of the scale relationships with GPA and ACT scores and to examine causality. The model they developed accounted for 16% of the variance in GPA and 12% of the variance in ACT score. The deep processing scale and the fact retention scale had the most important independent relationships with GPA. The fact retention relationship was direct whereas the deep processing relationship was mediated by ACT score. The results of this study suggested deep processing of information in terms of getting the big picture and the details leads to effective performance in the classroom. The results also suggested the Inventory of Learning Processes could successfully be used to predict
academic behavior.

Miller, Alway, and McKinley (1987) found students with high grade point averages (GPAs) scored significantly higher on the deep processing scale than those with average or low GPAs. The differences between deep processing of students with average and low GPAs was in the indicated direction but did not reach significance. A stepwise regression analysis revealed that across subjects deep processing accounted for more variance in GPA than any of the other Inventory of Learning Processes' scales or ACT score (an objective measure of ability). In fact, the mean ACT score of the low GPA group was higher than the mean ACT score of the average group. This suggested that the differences in GPA at least of these two groups was more a result of ineffective learning styles (in this case less deep processing) than differences in ability. The results of this study underline the importance of deep processing as an effective style of learning but they must be qualified by the relatively few students in each of the GPA categories. Even with this limitation, Miller et al.'s findings suggested the deep processing scale may be the most important contribution of the Inventory of Learning Processes to an academic behavior prediction system.

A study by Miller, Finley and McKinley (1990) used the Inventory of Learning Processes, the Approaches to Study Inventory (Entwistle & Ramsden, 1983) and the Study Processes
Questionnaire (Biggs, 1970a, 1970b, 1976) to assess differences in men and women's approaches to learning and motivation. Their results confirmed their hypothesis that men and women differ significantly in their study approaches. Among the differences found, Miller et al. reported that men scored significantly higher on deep processing, deep approach, comprehension learning and use of evidence than women. These scales all purport to measure the use of high levels of understanding and critical thinking. It appears that women are at a disadvantage because they use these approaches less extensively than men. Furthermore, stepwise regression analyses showed that the best predictors of GPA for men were disorganized study methods and deep processing, whereas disorganized study methods, negative attitudes toward studying and deep processing were the best predictors for women. If deep processing is really a measure of academic self-efficacy then these results speak to the importance of this construct in predicting academic success. Also, assuming the deep processing scale is a measure of academic self-efficacy, Miller et al.'s results fit in well with Betz and Hackett's findings (1981, 1983) that men had significantly higher occupational and academic self-efficacy scores than women and that higher self-efficacy was related to greater perceived academic and career options. Overall, Miller et al.'s findings suggested important differences in men's and women's approaches to learning tasks. Whether or
not the difference partially lies in academic self-efficacy expectations, their findings have important implications for academic prediction systems and their cross gender application.

Gadzella, Ginther and Williamson have also run a series of studies using the Inventory of Learning Processes (1986a, 1986b, 1987). These researchers (1986b) wanted to replicate and extend Schmeck et al.'s (1977) original findings. They were interested in determining the intercorrelations between the Inventory of Learning Processes' scales, the differences between high and low achievers on the Inventory of Learning Processes and the differences between deep and shallow processors on GPA and the other scales of the Inventory of Learning Processes. Their results supported Schmeck et al.'s conclusions. Even though there was a significant correlation between elaborative processing and deep processing, the authors concluded that the intercorrelations between the scales were low enough to justify four separate scales. Gadzella et al.'s results also confirmed Schmeck et al. in that deep processing and fact retention significantly differentiated low and high achievers, with high achievers using more of both strategies. Significant differences were also found between deep and shallow processors on elaborative processing, fact retention, and methodical study, as well as GPA. Deep processors used all three learning styles to a greater extent than shallow processors and had significantly
higher GPAs. These results extend Schmeck et al.’s study and reiterate the importance of the deep processing scale for predicting academic behavior.

A study by Gadzella and Williamson (1984) looked at the relationship between study skills, self concept and academic achievement. Although this study did not use the Inventory of Learning Processes it has implications for the connection between academic self-efficacy, as it relates to self concept, and learning styles. Gadzella et al. found significant positive correlations between self concept and academic achievement, study skills and academic achievement, and self concept and study skills. They concluded that students’ academic performance was a function of both study skills and how the student sees him or herself. Their finding of a significant positive correlation between self concept and academic achievement suggests that, if academic self-efficacy is a correlate of self concept, then the positive correlations between the deep processing scale and high academic achievement found in other studies may result from the fact that the deep processing scale actually measures academic self-efficacy.

Following this study, Gadzella, Ginther and Williamson (1986b) predicted that deep and shallow processors would differ significantly in their self concept. This time the Inventory of Learning Processes was used to categorize the students into deep and shallow processors. The results
indicated that total self concept scores were significantly higher for deep processors. Gadzella et al. concluded that student’s positive attitudes about self were associated with how they processed information. Alternatively, their results could be explained by assuming that deep processing is actually a measure of academic self-efficacy. If this is true, deep processors, or high academically self-efficacious students, would be expected to have higher self concepts assuming self concept is related to academic self-efficacy. Likewise, shallow processors, or students with low academic self-efficacy, would be expected to have lower self concepts. Thus, the relationship may be due to similarity of constructs rather than the more complicated explanation of relatedness.

The inclusion of the previous two articles in this review is not to suggest the equivalence of self concept and academic self-efficacy. Rather, it is to suggest that these researchers, whether they explicitly studied it or not, paved the way for the question addressed in the present study by showing a relationship between deep processing as measured by the Inventory of Learning Processes and constructs related to academic self-efficacy. Although these authors maintain that self concept does not cause academic achievement but rather leads to the use of more effective learning styles it is also possible that had they measured academic self-efficacy, Gadzella et al. would have found even more striking results that suggested the deep processing scale was indeed a measure
of academic self-efficacy.

A final study, looking at the validity of academic self-efficacy as a predictor of writing performance, was conducted by Meier, McCarthy and Schmeck (1984). These researchers suggested that how one cognitively processes information may affect academic self-efficacy beliefs, which in turn affect writing performance. Thus, they did not suggest that the deep processing scale was a measure of academic self-efficacy, but rather that deep processors (as identified by the Inventory of Learning Processes) were inclined to process information in such a way as to become highly self-efficacious. To identify level of cognitive processing they combined the deep processing scale and the elaborative processing scale from the Inventory of Learning Processes. Data analysis resulted in this combined score being a significant predictor of writing self-efficacy strength. Meier et al. concluded that deep processing likely contributed to forming accurate self-efficacy beliefs with respect to writing ability. An alternative explanation would be that the Inventory of Learning Processes' deep processing scale actually measured academic self-efficacy. The less than perfect correlation between the measures of depth of processing and academic self-efficacy in this study may be a function of both measurement error and the combined deep and elaborative processing score used in prediction.
The present study grew out of both the academic self-efficacy literature and the research involving learning styles. Although these areas have rarely been directly connected, the development of the Inventory of Learning Processes has provided a mechanism by which academic self-efficacy and deep processing can be linked. Specifically, this study explored the relationship between students' scores on the deep processing scale of the Inventory of Learning Processes, a measure of academic self-efficacy, and the meaning orientation scale of the Approaches to Studying Inventory (Entwistle & Ramsden, 1983). Each scale was correlated with the other two in order to identify any significant relationships. The hypothesis predicted that the correlation between the Inventory of Learning Processes' deep processing scale and the academic self-efficacy scale would be positive and significant. This prediction was based on the assertion that the deep processing scale may be more a measure of academic self-efficacy than deep processing. Two other predictions were necessary in order to make the interpretation of the hypothesis meaningful. The first check was included to establish that the deep processing scale of the Inventory of Learning Processes was measuring something other than deep processing. It predicted a non-significant relationship between the deep processing scale of the Inventory of Learning Processes and the meaning orientation scale of the
Approaches to Studying Inventory. The meaning orientation scale was used because it was characterized by Entwistle and Ramsden (1983) as a measure of critical thinking, intrinsic motivation and contrast and comparison. Conceptually the meaning orientation scale is very similar to how Schmeck et al. (1977) described the deep processing scale of the Inventory of Learning Processes. Thus, the meaning orientation scale served as an independent measure of deep processing. If the assertion that the deep processing scale of the Inventory of Learning Processes actually measures academic self-efficacy is correct than it follows that the correlation between the deep processing scale and an independent measure of deep processing would be non-significant.

The second check was included to establish that the constructs of deep processing and academic self-efficacy were not equal and therefore, an explanation involving definitional properties rather than measurement properties would not be acceptable. Thus, a non-significant correlation was expected between the meaning orientation scale and the academic self-efficacy measure. If the problem with the Inventory of Learning Processes was one of measurement then an independent measure of deep processing would not be expected to be correlated with academic self-efficacy. Regardless of the specific outcome of the present study, looking at both academic self-efficacy and learning styles
appears to be beneficial because both are intimately related to academic behavior and both would seem to be crucial components in academic prediction systems.
CHAPTER III

Method

Subjects

The subjects were 238 undergraduate students enrolled in introductory psychology courses at a large state university in the Midwest. Twenty-seven of the participants were transfer students. Because the requirements upon which the academic self-efficacy measure was based do not apply to transfer students their data were eliminated from the analysis. Also, three subjects provided incomplete data that were unusable in the statistical analysis. The remaining 208 students, 83 male and 125 female, constitute the data set upon which the analyses were based.

The ages of the subjects ranged from 17 to 40 with a mean age of 18.85 years old and a median age of 18. Approximately 81% of the participants were freshmen and 18% were sophomores. Less than 1% of the sample were juniors (2 subjects) and no seniors participated. Because this basic psychology course is required for most majors at the university, the subjects represented a variety of academic colleges and majors, however, because most participants were freshmen, the majority (86%) were currently enrolled in University College (UVC).
Procedure

Subjects completed the measure of academic self-efficacy, the Inventory of Learning Processes (Schmeck, Ribich & Ramanaiah, 1977), the Approaches to Studying Inventory (Entwistle & Ramsden, 1983), and a short demographic questionnaire. In order to maintain anonymity, each score sheet and demographic questionnaire was given an identification number such that subject names and responses were at no time matched. Subjects were run in groups of approximately 25 on four separate days spanning several weeks of the quarter. The demographic questionnaire was completed first by all subjects. The three inventories were counterbalanced by group such that each inventory was equally likely to be completed second, third or fourth. After distributing the instruments, the experimenter orally reviewed the instructions and answered any preliminary questions. Each subject worked at his/her own pace and most finished in approximately 40 minutes. A written debriefing statement explaining the purpose of the study was distributed after the subjects had completed their inventories and a summary of research findings was offered to any interested participant.

Instruments

Academic self-efficacy refers to a student's beliefs about his/her ability to successfully accomplish a particular academic task. The academic self-efficacy measure used in
the present study was constructed based on procedures used by Lent, Brown, and Larkin (1984, 1986, 1987) and Betz and Hackett (1981). This instrument was developed in order to make the academic self-efficacy assessment appropriate for The Ohio State undergraduate population from which the sample was selected (see Appendix A). The Global Academic Self-Efficacy Scale (Lent et al., 1991) provided a starting point for the academic self-efficacy scale used in this study. Eight of the 12 items from this scale were used in slightly modified form. The rest of the present scale (48 items) was based on the General Education Curriculum (GEC) requirements for students enrolled at The Ohio State University. These requirements applied to all students entering the university after summer quarter 1990 unless the student was transferring from another university. For this reason data from all transfer students were eliminated from the study. The core requirements of the GEC are divided into eight academic categories: writing and related skills, quantitative and logical skills, foreign language, social diversity in the United States, natural science, social science, arts and humanities, and capstone experience. There are multiple courses offered to fulfill each of the eight basic requirements. The academic self-efficacy inventory assessed each academic category with six statements. Each statement identified a particular course that could be taken to fulfill the core requirement and the academic level
associated with that course, with higher numbers indicating more advanced courses. Although there is no specific university rule that course levels must follow, informal inquiries among students suggested that the general student perception associated 100 level courses with freshmen, 200 level courses with sophomores, 300 level courses with juniors and 400, 500, and 600 level courses with seniors.

The specific course identified in each statement was selected by a three step process. First, within each academic category classes addressing highly related topics were grouped together, for instance under the natural science academic category the following were considered major topics under which related classes were grouped: Biology (the number of classes grouped under this topic was 12), chemistry (18), geology (14), physics (13), anatomy and physiology (2), and zoology (3). If more than six groups were formed random selection was used to determine those that were included in the study. The second step was to identify examples of what the course might cover from The Ohio State University Bulletin of Course Offerings, for instance a 300 level course in English could be described by composition, literature, or essay writing. The examples used in the study were selected randomly from the possible alternatives. Finally, the six statements within each academic category were arranged in a random order.
Students were asked to rate each statement on a five point scale ranging from no confidence at all to complete confidence in their ability to complete each specified course with a grade of at least a B. Some example items from the academic self-efficacy measure include the following: "Complete a 300 level course in Economics (e.g., history of U.S. Economics) with a grade of at least a B", "Complete the first through the fourth course (e.g., 101-104) of Italian with a grade of at least a B", and "Complete a 100 level course in Art (e.g., drawing) with a grade of at least a B." Each item was then scored according to the individual's response with a range of one to five points. Answers of no confidence at all received one point, little confidence received two points, and so on through complete confidence which received five points. Point values were summed across all 56 items resulting in a strength of academic self-efficacy score for each individual. The possible range was 56 to 280 points, with higher values indicating greater academic self-efficacy.

The Inventory of Learning Processes (Schmeck, Ribich & Ramanaiah, 1977) is a 62-item forced choice survey consisting of four scales used to assess students' learning styles (see Appendix B). The scales of this measure are: deep processing, elaborative processing, fact retention and methodical study. Although the entire inventory was given to the subjects, only the scores on the deep processing scale
were of interest in the present study. Deep processing refers to a learning style whereby students use elaboration, critical analysis, and contrast and comparison to understand and encode information. Items of this scale attempt to assess students' use of these deep processing principles, for example, "I have trouble organizing the information that I remember", "I try to resolve conflicts between the information obtained from different sources", and "I can usually formulate a good guess even when I don't know the answer."

Schmeck et al. reported adequate psychometric data for the Inventory of Learning Processes. The test-retest reliabilities for a two week interval for the four scales range from .79 to .88, with deep processing reliability equaling .88. The internal consistencies ranged from .58 to .82, with deep processing having an internal consistency of .82. Subjects were asked to answer true or false to each of the 62 Inventory of Learning Processes' items according to whether the statement applied to the individual or did not apply, respectively. Answers to the 18 items making up the deep processing scale were then separated from the other three scales. Each item that was answered in the indicated direction for deep processing was assigned one point and the individual's deep processing score equaled the sum of these points. The highest score possible was 18 and the lowest was zero, with higher scores representing more extensive use of
deep processing.

Entwistle and Ramsden (1983) constructed the Approaches to Studying Inventory as a means of identifying distinct study approaches. This 64-item survey consisted of 16 subscales that were categorized into four general orientations to studying through a factor analysis (see Appendix C). The first orientation was called meaning orientation and described students who critically evaluated information and related new ideas to already known information. The four subscales comprising this orientation were deep approach, use of evidence, intrinsic motivation and relating ideas. Items making up the meaning orientation scale correspond closely to the types of items found in the Inventory of Learning Processes' deep processing scale, for example, "I am usually cautious about drawing conclusions unless they are well supported by evidence", "When tackling a new topic I often ask myself questions about it which the new information should answer", and "I find it helpful to 'map out' a new topic for myself by seeing how the ideas fit together." The meaning orientation scale was used as an independent measure of deep processing because of its conceptual similarity to the Inventory of Learning Processes' deep processing scale.

The second orientation of the Approaches to Studying Inventory was called the reproducing orientation and referred to students who used a surface level approach to studying.
Four subscales were subsumed under this orientation, surface approach, fear of failure, syllabus-boundness, and extrinsic motivation. The third orientation was characterized by students who simply wanted to succeed in college and was called the achievement orientation. The subscales defining this orientation were strategic approach, disorganized study methods, negative attitudes, and achievement motivation. Finally, the fourth orientation was called styles and pathologies of learning. This orientation attempted to measure Pask's (1976) concepts of two learning styles and their accompanying pathologies. Comprehension learning, globetrotting, operation learning and improvidence were the four subscales comprising this orientation. Although the entire inventory was given to students, only the meaning orientation was used in the present study.

Entwistle and Ramsden (1983) reported adequate psychometric data for most of the Approaches to Studying Inventory orientations and individual subscales. The internal consistencies of the orientations range from .70 to .79, with the meaning orientation having a Cronbach Alpha equal to .79. Subjects were asked to rate each of the 64 items on a five point scale ranging from A, definitely agree, to E, definitely disagree. The 16 items making up the meaning orientation scale were selected from the total inventory responses and reverse scored such that a value of one was assigned to all E responses through a value of five
for all A responses. Item scores were then summed to generate a total meaning orientation score that could range from 64 to 320, with higher scores indicating greater use of this approach to learning.
CHAPTER IV

Results

Because the academic self-efficacy measure was developed for this study the first analysis was designed to determine its psychometric properties. Due to a limited subject pool and because the measure was an outgrowth of previous work (Lent, Brown & Larkin, 1984, 1986, 1991) that has shown adequate test-retest reliabilities, the main concern of the present analysis was internal consistency. A series of Cronbach coefficient alphas were calculated for the academic self-efficacy scale. The first analysis addressed the internal consistency of the scale as a whole, providing an indication of global academic self-efficacy. The Cronbach coefficient alpha was .96. This result suggests high internal consistency; however, because Cronbach's alpha is affected by the number of items over which it is calculated the alpha may be artificially inflated.

Because of the likely overestimation of the total coefficient alpha the scale was broken down in two ways and coefficient alphas were recalculated. First, the measure was divided into the eight academic categories described previously and a ninth category consisting of those items taken directly from Lent et al.'s (1991) Global Academic Self-Efficacy Scale. It was reasonable to predict that
students would have fairly consistent academic self-efficacy expectations within academic categories and therefore, this was a meaningful way of breaking down the inventory. Coefficient alphas were calculated based on six statements for each academic category and eight statements for the category deriving from Lent et al.'s work. Results for the nine sections were as follows: Writing and related skills .79, quantitative and logical skills .83, foreign language .95, social diversity in the United States .88, natural science .86, social science .86, arts and humanities .80, capstone experience .87, and Lent et al.'s Global Academic Self-Efficacy items .88 (See Table 1). All of these values fall within acceptable ranges to suggest an adequate level of internal consistency for the instrument.

Another breakdown of the inventory was assessed based on the premise that students might be more likely to show consistency across course level rather than subject area, that is, the more-advanced courses should all be construed as more difficult regardless of the academic category into which they fall than the lower level courses. Items of the inventory were divided into four groups according to course level. The groups corresponded to students' perceptions of what level courses freshmen, sophomores, juniors, and seniors take. The number of items assessed per level varied between seven and 16. The items taken directly from Lent et al. were not included in this analysis. The results for these groups
were as follows: 100 level courses .88 (16 items), 200 level courses .88 (12 items), 300 level courses .82 (7 items), and 400, 500, and 600 level courses .92 (13 items) (See Table 2). Again, internal consistency of the scale was confirmed suggesting the accuracy of the data results.

The specific hypothesis proposed in this study centered around the proposition that the deep processing scale of the Inventory of Learning Processes, (Schmeck, Ribich, & Ramanaiah, 1977) contrary to its name, may actually measure academic self-efficacy. The hypothesis predicted a significant positive correlation between the measure of academic self-efficacy and the deep processing scale of the Inventory of Learning Processes. Two checks were included in the study in order to make the interpretation of the hypothesis meaningful. The first check predicted a non-significant correlation between the deep processing scale and the meaning orientation scale of Entwistle and Ramsden’s (1983) Approaches to Studying Inventory. The meaning orientation scale was chosen as an independent measure of deep processing because its description was very similar to that characterizing the deep processing scale. The wording of its questions, however, was less ambiguous which suggests the meaning orientation scale did measure the actual use of deep processing strategies rather than a student’s academic self-efficacy with respect to these strategies. The prediction made by the first check follows directly from the
hypothesis of the study. If the deep processing scale of the Inventory of Learning Processes measures a student’s academic self-efficacy then we would expect the deep processing scale to be uncorrelated with an instrument measuring use of deep processing. The second check predicted that the relationship between the meaning orientation scale and the academic self-efficacy scale would be non-significant. This check was included in order to establish that the constructs of deep processing and academic self-efficacy were not equal. Support for the prediction of check two would suggest that the measurement of constructs and not their definitions would explain any relationship between the deep processing scale and the academic self-efficacy scale.

The hypothesis and checks were addressed by running Pearson product moment correlations between the three variables of interest: deep processing of the Inventory of Learning Processes, meaning orientation of the Approaches to Studying Inventory and academic self-efficacy. Each variable was plotted against both of the others to check for linearity. Because no obvious nonlinear trends were observed linearity was assumed making the calculated correlations valid. Table 3 shows the means, standard deviations and range for each of the three variables. Table 4 contains the correlational matrix and the significance tests for each simple correlation.
The two checks were evaluated first in order to make certain the interpretation of the hypothesis would be meaningful. In contrast to the prediction of check one, the correlation between the deep processing scale and the meaning orientation scale was significant beyond the .001 level with a value of .28. This finding suggests that contrary to the hypothesis the deep processing scale of the Inventory of Learning Processes does seem, at least in part, to measure deep processing. It may be that some items of the deep processing scale do measure actual deep processing while others do not. Check two predicted a non-significant correlation would be found between the meaning orientation scale and the academic self-efficacy scale. This prediction was supported, $t(207) = .12, p > .01$. This finding suggested that deep processing and academic self-efficacy were distinguishable as constructs and therefore, any relationship between the deep processing scale of the Inventory of Learning Processes and the academic self-efficacy measure would be most appropriately addressed as a consequence of measurement.

The hypothesis that the deep processing scale of the Inventory of Learning Processes and the academic self-efficacy scale would be significantly related in a positive direction was corroborated by the results, $t(207) = .49, p < .001$. This finding is tempered by the significant correlation between the deep processing scale and
the meaning orientation scale, but it is worth noting that
the former correlation was much stronger than the latter, .49
as compared to .28. Hotelling's (1940) t-test of the
difference between dependent correlation coefficients was run
and the results confirmed that these two correlations were
significantly different, t(205)=2.74, p<.01. There is also
an obvious difference between the two in terms of practical
significance. The relationship between the deep processing
scale and the academic self-efficacy scale accounts for 24%
of the variance whereas the relationship between the deep
processing scale and the meaning orientation scale only
accounts for 8% of the variance. In general, these results
do support the assertion behind the hypothesis, that the deep
processing scale of the Inventory of Learning Processes
appears to be more a measure of academic self-efficacy than
deep processing.

The significant positive correlation found between the
deep processing scale and both the meaning orientation scale
and the measure of academic self-efficacy suggested that some
of the items of the deep processing scale were possibly
measuring deep processing while others were measures of
academic self-efficacy. This was explored through a post hoc
analysis of item-total Pearson product moment correlations.
If the items of the deep processing scale correlated
differentially with the total deep processing scale score,
meaning orientation scale score, and academic self-efficacy
scale score it would lend support to the possibility that the deep processing scale contained both academic self-efficacy and deep processing items.

Two independent raters separated the 18 items of the deep processing scale into two categories based on face validity, one appearing to measure academic self-efficacy and the other appearing to measure deep processing. The inter-rater reliability was .94 with raters disagreeing on the categorization of only one item. The discrepant item was number 17 ("I try to resolve conflicts between the information obtained from different sources"). Disregarding item 17, the raters agreed on six items measuring deep processing and 11 items measuring academic self-efficacy. This categorization was consistent with the hypothesis that the deep processing scale was more strongly related to academic self-efficacy than deep processing. Table 5 presents the item-total correlations for all of the deep processing scale items with the total deep processing score, the total meaning orientation score, and the total academic self-efficacy score, respectively (see Appendix B for items).

The correlations of the items identified as measuring deep processing and academic self-efficacy with the total deep processing scale score tentatively support the prediction of two distinct constructs measured by the deep processing scale. All of the item-total correlations were significant beyond the .001 level. Of the six items
identified as measuring deep processing, none had correlations above .47 and the range was from .34 to .47. In contrast to this, all but two of the items identified as measuring academic self-efficacy were above .47, with a range from .36 to .64. It seems that with the exception of items 17, 50, and 54 the item-total correlations between the deep processing scale items and the deep processing scale total score match the predictions that two distinct groups of items would be found.

The item-total correlations for the other two scales were more difficult to interpret than those between the deep processing items and the total deep processing score. Overall, there were very low item-total correlations between the deep processing items and the total meaning orientation score, the range was from .02 to .40. Only three of the six deep processing items identified as measuring deep processing were significantly related at or beyond the .05 level. If these items were measuring deep processing significant positive correlations would be expected between all of these items and the total meaning orientation score. Also, three of the 11 deep processing scale items identified as measuring academic self-efficacy were significant at or beyond the .05 level. To conform to expectations, none of these items should have been significantly correlated with the total meaning orientation scale, but the fact that only three items were significantly correlated does suggest these items are
not measuring deep processing. Overall, due to mostly non-significant correlations, the deep processing scale items do not seem to correlate differentially with the total meaning orientation score. Thus, these item-total correlations do not support the conclusion that the deep processing scale consists of two groups of items, some measuring deep processing and others measuring academic self-efficacy.

All but two of the item-total correlations between the deep processing items and the total academic self-efficacy score were significant at or beyond the .01 level. For those items identified as measuring deep processing the correlations ranged from .12 to .33. For items identified as measuring academic self-efficacy the range was .16 to .40. As expected the range for the items identified as measuring academic self-efficacy was higher than that for the items identified as measuring deep processing, but the overall pattern of correlations was very similar for the two groups. At best, these results tentatively support the prediction that the item-total correlations between the deep processing scale items and the academic self-efficacy inventory would discriminate between items identified as measuring deep processing and those identified as measuring academic self-efficacy.

Thus, the post hoc analysis provided mixed results. The item-total correlations between the deep processing items and
the total deep processing score did suggest that the deep processing scale may be a combination of two different types of items, some assessing the actual use of deep processing and others assessing academic self-efficacy. The item-total correlations between the deep processing items and the total academic self-efficacy score also tentatively supported this conclusion. The item-total correlations between the deep processing items and the total meaning orientation score did not discriminate between items identified as measuring deep processing and those identified as measuring academic self-efficacy indicating that more research is needed.
Table 1
Coefficient Alpha Correlations for the total Academic Self-Efficacy Measure and for each Academic Category

<table>
<thead>
<tr>
<th></th>
<th>Coefficient Alpha</th>
<th>Number of Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Academic Self-Efficacy Measure</td>
<td>.96</td>
<td>56</td>
</tr>
<tr>
<td>Writing and Related Skills</td>
<td>.79</td>
<td>6</td>
</tr>
<tr>
<td>Quantitative and Logical Skills</td>
<td>.83</td>
<td>6</td>
</tr>
<tr>
<td>Foreign Language</td>
<td>.95</td>
<td>6</td>
</tr>
<tr>
<td>Social Diversity in the U.S.</td>
<td>.88</td>
<td>6</td>
</tr>
<tr>
<td>Natural Science</td>
<td>.86</td>
<td>6</td>
</tr>
<tr>
<td>Social Science</td>
<td>.86</td>
<td>6</td>
</tr>
<tr>
<td>Arts and Humanities</td>
<td>.80</td>
<td>6</td>
</tr>
<tr>
<td>Capstone Experience</td>
<td>.87</td>
<td>6</td>
</tr>
<tr>
<td>Global Academic Self-Efficacy Items (Lent, Brown, &amp; Larkin, 1991)</td>
<td>.88</td>
<td>8</td>
</tr>
</tbody>
</table>

Table 2
Coefficient Alpha Correlations for the academic levels of the Academic Self-Efficacy Measure

<table>
<thead>
<tr>
<th>Course Levels</th>
<th>Corresponding Class Rank</th>
<th>Number of Items</th>
<th>Coefficient Alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>Freshman</td>
<td>16</td>
<td>.88</td>
</tr>
<tr>
<td>200</td>
<td>Sophomore</td>
<td>12</td>
<td>.88</td>
</tr>
<tr>
<td>300</td>
<td>Junior</td>
<td>7</td>
<td>.82</td>
</tr>
<tr>
<td>400, 500, 600</td>
<td>Senior</td>
<td>13</td>
<td>.92</td>
</tr>
</tbody>
</table>
Table 3

Deep processing, meaning orientation and academic self-efficacy score means, standard deviations and variable range

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deep processing</td>
<td>10.41</td>
<td>4.15</td>
<td>0.00</td>
<td>18.00</td>
</tr>
<tr>
<td>Meaning orientation</td>
<td>41.16</td>
<td>8.39</td>
<td>20.00</td>
<td>59.00</td>
</tr>
<tr>
<td>Academic Self-efficacy</td>
<td>190.34</td>
<td>31.21</td>
<td>95.00</td>
<td>280.00</td>
</tr>
</tbody>
</table>

Table 4

Correlational matrix and significance tests for the variables deep processing, meaning orientation and academic self-efficacy

<table>
<thead>
<tr>
<th></th>
<th>Meaning Orientation</th>
<th>Academic Self-Efficacy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deep Processing</td>
<td>.28</td>
<td>.49</td>
</tr>
<tr>
<td>Significance level</td>
<td>.0001</td>
<td>.0001</td>
</tr>
<tr>
<td>Meaning Orientation</td>
<td>--</td>
<td>.12</td>
</tr>
<tr>
<td>Significance level</td>
<td></td>
<td>.09</td>
</tr>
</tbody>
</table>
Table 5

Item-total correlation coefficients for the Deep Processing Scale, the Meaning Orientation Scale and the Academic Self-Efficacy Scale

<table>
<thead>
<tr>
<th>Items identified as measuring deep processing</th>
<th>Deep Processing Scale</th>
<th>Meaning Orientation Scale</th>
<th>Academic Self-Efficacy Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>21</td>
<td>.34, p&lt;.001</td>
<td>.15, p&lt;.05</td>
<td>.12, p&gt;.05</td>
</tr>
<tr>
<td>36</td>
<td>.45, p&lt;.001</td>
<td>.40, p&lt;.001</td>
<td>.21, p&lt;.001</td>
</tr>
<tr>
<td>44</td>
<td>.45, p&lt;.001</td>
<td>.03, p&gt;.05</td>
<td>.28, p&lt;.001</td>
</tr>
<tr>
<td>46</td>
<td>.38, p&lt;.001</td>
<td>.06, p&gt;.05</td>
<td>.23, p&lt;.001</td>
</tr>
<tr>
<td>60</td>
<td>.38, p&lt;.001</td>
<td>-.09, p&gt;.05</td>
<td>.20, p&lt;.01</td>
</tr>
<tr>
<td>70</td>
<td>.47, p&lt;.001</td>
<td>.16, p&lt;.05</td>
<td>.33, p&lt;.001</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Items identified as measuring self-efficacy</th>
<th>Deep Processing Scale</th>
<th>Meaning Orientation Scale</th>
<th>Academic Self-Efficacy Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>.51, p&lt;.001</td>
<td>.09, p&gt;.05</td>
<td>.24, p&lt;.001</td>
</tr>
<tr>
<td>8</td>
<td>.63, p&lt;.001</td>
<td>.10, p&gt;.05</td>
<td>.30, p&lt;.001</td>
</tr>
<tr>
<td>9</td>
<td>.54, p&lt;.001</td>
<td>-.07, p&gt;.05</td>
<td>.22, p&lt;.001</td>
</tr>
<tr>
<td>24</td>
<td>.53, p&lt;.001</td>
<td>.13, p&lt;.05</td>
<td>.22, p&lt;.001</td>
</tr>
<tr>
<td>28</td>
<td>.54, p&lt;.001</td>
<td>.10, p&gt;.05</td>
<td>.24, p&lt;.001</td>
</tr>
<tr>
<td>30</td>
<td>.48, p&lt;.001</td>
<td>.11, p&gt;.05</td>
<td>.28, p&lt;.001</td>
</tr>
<tr>
<td>32</td>
<td>.64, p&lt;.001</td>
<td>.08, p&gt;.05</td>
<td>.29, p&lt;.001</td>
</tr>
<tr>
<td>50</td>
<td>.36, p&lt;.001</td>
<td>.02, p&gt;.05</td>
<td>.16, p&lt;.05</td>
</tr>
<tr>
<td>54</td>
<td>.42, p&lt;.001</td>
<td>.17, p&lt;.05</td>
<td>.18, p&lt;.01</td>
</tr>
<tr>
<td>56</td>
<td>.64, p&lt;.001</td>
<td>.33, p&lt;.001</td>
<td>.40, p&lt;.001</td>
</tr>
<tr>
<td>65</td>
<td>.54, p&lt;.001</td>
<td>.05, p&gt;.05</td>
<td>.26, p&lt;.001</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Discrepant Items</th>
<th>Deep Processing Scale</th>
<th>Meaning Orientation Scale</th>
<th>Academic Self-Efficacy Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>17</td>
<td>.32, p&lt;.001</td>
<td>.37, p&lt;.001</td>
<td>.08, p&gt;.05</td>
</tr>
</tbody>
</table>
CHAPTER V

Discussion

The hypothesis addressed in the present study was based on the assertion that the deep processing scale of the Inventory of Learning Processes was a more accurate measure of students' academic self-efficacy with respect to deep processing tasks than their actual use of deep processing techniques. This assertion was addressed by predicting that the deep processing scale of the Inventory of Learning Processes would have a significant positive correlation with the measure of academic self-efficacy. In order to make this correlation meaningful, however, two checks needed to be implemented. The first check was included to establish that the deep processing scale was not measuring the deep processing construct. This check was evaluated by assessing the correlation between the deep processing scale of the Inventory of Learning Processes and the meaning orientation scale of the Approaches to Studying Inventory. The prediction that the correlation would not reach significance was not supported by the results. A significant positive relationship was found between the two scales. This finding suggests that the deep processing scale is at least in part measuring the deep processing construct that its name suggests. However, the fact that the relationship was low in
absolute value leads to the possible explanation that certain items of the Inventory of Learning Processes do measure deep processing while others do not. This possibility will be elaborated upon later in the discussion.

The second check for the study evaluated the correlation between the meaning orientation scale and the academic self-efficacy scale. It was included in order to establish that academic self-efficacy and deep processing were distinguishable constructs. The non-significant correlation corroborated this distinction. An alternative explanation of course is that the meaning orientation scale of the Approaches to Studying Inventory is an inaccurate measure of deep processing and, therefore, it is possible that deep processing and academic self-efficacy are interchangeable constructs. However, this is unlikely due to studies supporting the validity and unidimensionality of this scale (Entwistle & Ramsden, 1983; Harper & Kember, 1986, 1989; Kember & Harper, 1987; Watkins, 1982).

The checks of the study basically corroborate the distinction between the constructs of deep processing and academic self-efficacy, although they do not support the prediction that the deep processing scale is totally separate from the deep processing construct. Keeping this context in mind the hypothesis can now be interpreted. Results indicated that the deep processing scale of the Inventory of Learning Processes was strongly related to academic self-efficacy
suggesting that the title and description of this scale may be misleading. Instead of measuring the deep processing that students use these results suggest that the deep processing scale measures, at least in part, a student's confidence in his/her ability to successfully perform a deep processing task. There is a subtle but important difference between these conceptions of the scale. The first suggests an inventory measuring behavior while the second suggests an inventory measuring potential behavior. Thus, the results of the present study suggest a reconceptualization of the deep processing scale of the Inventory of Learning Processes. It seems appropriate to think of this scale as measuring a student's academic self-efficacy with respect to deep processing tasks as well as their actual use of deep processing.

An alternative explanation for the high correlation between deep processing of the Inventory of Learning Processes and academic self-efficacy is the idea that deep processors are simply more academically self-efficacious than shallow processors. In other words, the correlation exists because these two traits, deep processing and academic self-efficacy, are highly likely to occur together and not because the deep processing scale of the Inventory of Learning Processes measures academic self-efficacy. If this were true, however, one would expect that any measure of deep processing would be highly related to the academic
self-efficacy measure. The results show that this is not the case. As predicted the meaning orientation scale of the Approaches to Studying Inventory, another measure of deep processing, was non-significantly related to the academic self-efficacy measure used in the study. Thus, this alternative explanation does not appear to be supported by the results.

The significant positive relationship between the deep processing scale and the meaning orientation scale must be addressed further. This correlation diminishes the clarity of the relationship between the deep processing scale and the academic self-efficacy scale because it shows a relationship between the two scales which purport to measure deep processing, just as one would expect if indeed they were measuring the same construct. This finding is not irreconcilable however, because even though there is a significant statistical relationship between the deep processing scale and the meaning orientation scale, this correlation is significantly weaker than the correlation between the deep processing scale and the academic self-efficacy scale. Furthermore, in terms of practical significance, the correlation between the deep processing scale and the meaning orientation scale only accounts for 8% of the variance whereas the correlation between the deep processing scale and the academic self-efficacy scale accounts for 24% of the variance. These findings support the
assertion that the deep processing scale of the Inventory of Learning Processes is more a measure of academic self-efficacy than deep processing.

One explanation for the correlation between the deep processing scale and the meaning orientation scale is that most items of the deep processing scale of the Inventory of Learning Processes measure academic self-efficacy while some are worded in such a way as to truly measure deep processing. If this is the case a significant relationship between the deep processing scale and independent scales of academic self-efficacy as well as deep processing would be expected. This explanation implies that more research is needed to determine which items of the Inventory of Learning Processes' deep processing scale measure deep processing and which measure academic self-efficacy. One possibility for future research may be to factor analyze the Inventory of Learning Processes to determine if the deep processing scale needs to be divided into two factors, one representing deep processing and the other representing academic self-efficacy. If the scale correlated with both academic self-efficacy and deep processing because it contains a mixture of items we would expect these items to load differentially on the deep processing factor.

Another way of obtaining a clearer picture of the deep processing scale is to look at how each item from the deep processing scale correlates with the total deep processing
score, the total meaning orientation score and the total academic self-efficacy score. If the items represent different constructs we would expect them to correlate differentially with the total scale scores. A post hoc analysis was conducted to assess this prediction. Two independent raters separated the deep processing scale items into two categories, those appearing to measure deep processing and those appearing to measure academic self-efficacy. The item-total correlations between the deep processing items and the deep processing total score did appear to discriminate between the two designated groups. Item-total correlations for items identified as measuring academic self-efficacy were relatively consistently larger than item-total correlations for items measuring deep processing.

This difference was not born out in the item-total correlations between the deep processing scale items and the total meaning orientation score. The expectation that the items identified as measuring deep processing would be more strongly correlated to the total meaning orientation score than the items identified as measuring academic self-efficacy was not corroborated due to a preponderance of non-significant correlations for both groups. One possible explanation for this finding is that the meaning orientation scale does not assess deep processing. As stated earlier, research (Entwistle & Ramsden, 1983, Harper & Kember, 1986,
1989; Kember & Harper, 1987; Watkins, 1982) tends to dispute this possibility, but it is worth noting that the Approaches to Studying Inventory and most of the subsequent research using this inventory has been conducted outside of the United States. Certainly differences in educational systems may affect approaches to studying. It is possible that this factor may be responsible for the overall low correlations between the deep processing scale items and the total meaning orientation score.

The item-total correlations between the deep processing items and the total academic self-efficacy score minimally supported the discrimination between items identified as measuring deep processing and those identified as measuring academic self-efficacy. As expected, the correlations were slightly higher for the items appearing to measure academic self-efficacy, but these differences were small and therefore, require further exploration before any firm conclusions can be drawn.

Overall, these results tentatively support both the assertion that the deep processing scale measures academic self-efficacy more accurately than deep processing and that there may be a combination of academic self-efficacy and deep processing items in this scale. Obviously, until more research is completed researchers need to be cautious when employing the deep processing scale of the Inventory of Learning Processes.
Several possible limitations to the present study are worth mentioning. First, because all data were collected through self-report measures it is impossible to ascertain how accurately subjects' responses reflect their behaviors. Social desirability may be one complicating factor that could have resulted in inaccurate reporting. Attempts were made to minimize the influence of this variable by stressing to subjects the anonymity of responses and the necessity of accurate data. Because no social desirability measure was included in the study, however, the possibility that this variable was operating cannot be ruled out.

The fact that gender differences were not analyzed in the present study may represent a second limitation. Gender differences have been found in terms of occupational self-efficacy as well as academic self-efficacy in some studies. Betz and Hackett (1981) and Wheeler (1983) found significant gender differences such that men had higher occupational self-efficacy than women. Betz and Hackett (1983) also found mathematics self-efficacy favoring men, but Lent, Brown and Larkin (1984, 1986) found no sex differences in their work on academic self-efficacy. The relationship between gender and deep processing has also been investigated, for example, Miller, Finley, and McKinley (1990) found men scored significantly higher on deep processing than women. It is possible that the Pearson correlation coefficients between the deep processing scale,
the meaning orientation scale, and the academic self-efficacy scale varied by gender. If this is the case, then the current interpretation may be misleading. Future research should check for this possibility by including gender as a variable of study.

The purpose of the present study was to determine whether the deep processing scale of the Inventory of Learning Processes measures academic self-efficacy rather than, or in addition to deep processing as its name suggests. Clarity between these interpretations of the scale is essential in the literature for several reasons. First, explicit definitions are crucial for any research if it is to be meaningfully interpreted and applied. If we continue to think of the Inventory of Learning Processes' deep processing scale as a measure of deep processing when in fact it may measure academic self-efficacy or some combination of the two constructs, we do the literature a disservice. Second, researchers of academic self-efficacy and those of the Inventory of Learning Processes have proceeded apparently almost totally without awareness of each other. If the Inventory of Learning Processes is measuring academic self-efficacy then it would behoove these researchers to not only acknowledge one another but to combine efforts in some way to reach common goals. Finally, it is important to clarify what the deep processing scale measures if researchers in this area hope to develop an accurate academic
prediction system.

The literature reviewed in this study has given ample evidence to relate academic performance (as measured by grade point average) with both the deep processing scale of the Inventory of Learning Processes (Schmeck & Grove, 1979; Schmeck, 1983; Gadzella, Ginther & Williamson, 1986b; Miller, Alway & McKinley, 1987) and academic self-efficacy (Betz & Hackett, 1981, 1983; Lent, Brown, & Larkin, 1984, 1986, 1987; Wheeler, 1983). From the results of the present study it is no surprise that the relationships are strikingly similar, that is, as either deep processing scores on the Inventory of Learning Processes or academic self-efficacy scores increase, GPA is also likely to increase. According to the results of this study it may not be simply the case that deep processors (as measured by the Inventory of Learning Processes) tend to be more academically self-efficacious than shallow processors, but rather that researchers are looking at two separate measures of the same construct or at least that there is considerable overlap in the Inventory of Learning Processes measure of deep processing and the academic self-efficacy measure. The implication of the present study is that the items of the Inventory of Learning Processes' deep processing scale assess a mixture of these two constructs. Clarifying more explicitly what each item of this scale measures seems a necessary step for the continued use of this inventory and an important determinant of the
future direction of research on both the Inventory of Learning Processes and academic self-efficacy.
Chapter VI

Summary

The aim of the present study was to clarify what is measured by the deep processing scale of the Inventory of Learning Processes (Schmeck, Ribich, Ramanaiah, 1977). The author of the study proposed that the deep processing scale measures a student's academic self-efficacy with respect to deep processing tasks rather than the student's actual use of such tasks. To assess this proposition it was hypothesized that scores on the deep processing scale of the Inventory of Learning Processes would have a significant positive correlation with scores on a measure of academic self-efficacy. Two checks were necessary in order to make the interpretation of the hypothesis meaningful. The first check predicted that scores on the deep processing scale of the Inventory of Learning Processes would be insignificantly related to scores on an independent measure of deep processing (the meaning orientation scale of the Approaches to Studying Inventory, Entwistle & Ramsden, 1983). This check was included in order to establish that the deep processing scale was measuring something other than deep processing. The second check predicted that the meaning orientation scale and the academic self-efficacy scale would be insignificantly correlated. This check was included to confirm the distinction between academic self-efficacy and
deep processing as constructs. It was necessary in order to interpret the hypothesis of the study as a measurement problem and not a construct definition problem.

A correlational matrix was run on the three variables of interest: deep processing of the Inventory of Learning Processes, academic self-efficacy, and meaning orientation of the Approaches to Studying Inventory. The two checks were evaluated first. Contrary to the prediction of check one, a significant positive correlation was found between the deep processing scale and the meaning orientation scale suggesting that the deep processing scale does measure, at least in part, a student’s use of deep processing. An insignificant relationship was found between the meaning orientation scale and the academic self-efficacy scale as predicted by check two. This corroborated the assertion that academic self-efficacy and deep processing are distinct constructs and any relationship between the two cannot adequately be accounted for by a definitional reinterpretation. The hypothesis, that the deep processing scale and the academic self-efficacy scale would be related was supported. This relationship was found to be both statistically and practically much stronger than the relationship between the deep processing scale and the meaning orientation scale.

In general, the results support the assertion that the deep processing scale is more a measure of academic self-efficacy than deep processing, however, this is tempered
by the significant positive relationship between the deep processing scale and the meaning orientation scale. One possible explanation for this finding is that the deep processing scale of the Inventory of Learning Processes contains a mixture of items, some assessing actual deep processing and others assessing a student's self-efficacy with respect to this construct. Post hoc analyses on item-total correlations between the deep processing items and both the total deep processing score and the total academic self-efficacy score seem to lend support to this explanation by differentiating the items identified as measuring deep processing from those identified as measuring academic self-efficacy. However, item-total correlations between the deep processing items and the total meaning orientation score did not differentiate the two proposed groups of items. Thus, the idea that the deep processing scale contains a mixture of items assessing academic self-efficacy and deep processing seems to warrant further investigation. Until this research is done, researchers using the Inventory of Learning Processes must be wary of its problems and structure their interpretations accordingly.
APPENDIX A

THE ACADEMIC SELF-EFFICACY INVENTORY
The Academic Self-Efficacy Inventory

Assuming you were motivated to do your best, please indicate how much confidence you have that you could do each of the following at some point during your 4 years at OSU:

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
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<tbody>
<tr>
<td>No Confidence at all</td>
<td>Little Confidence</td>
<td>Some Confidence</td>
<td>Much Confidence</td>
<td>Complete Confidence</td>
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136. Complete a 500 level course in Communication (e.g., advanced argumentation) with a grade of at least a B.
137. Complete a 500 level course in Zoology (e.g., study of evolution) with a grade of at least a B.
138. Complete a 300 level course in English (e.g., composition) with a grade of at least a B.
139. Complete a freshman English composition and literature course with a grade of at least a B.
140. Complete a 300 level course in Communication (e.g., principles of debate) with a grade of at least a B.
141. Complete a 300 level course in Economics (e.g., history of U.S. economics) with a grade of at least a B.
142. Complete a 100 level course in Calculus (e.g., integrals) with a grade of at least a B.
143. Complete a 200 level course in Philosophy (e.g., logic) with a grade of at least a B.
144. Complete a 200 level course in Analytic Geometry (e.g., multiple integrals) with a grade of at least a B.
145. Complete a 100 level course in Basic Computational Skills (e.g., quadratic equations) with a grade of at least a B.
146. Complete a 200 level course in General Data Analysis (e.g., applying statistics to interpret quantitative data on the computer) with a grade of at least a B.
147. Complete a 500 level course in Specialized Data Analysis (e.g., data generation) with a grade of at least a B.
<table>
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<tr>
<th>No Confidence at all</th>
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<td>B</td>
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148. Complete the first through the fourth course (e.g., 101-104) of Romanian with a grade of at least a B.

149. Complete the first through the fourth course (e.g., 101-104) of Italian with a grade of at least a B.

150. Complete the first through the fourth course (e.g., 101-104) of Arabic with a grade of at least a B.

151. Complete the first through the fourth course (e.g., 101-104) of Korean with a grade of at least a B.

152. Complete the first through the fourth course (e.g., 101-104) of Latin with a grade of at least a B.

153. Complete the first through the fourth course (e.g., 101-104) of Hebrew with a grade of at least a B.

154. Complete a 500 level course in Biology with emphasis on social diversity (e.g., the biology of race) with a grade of at least a B.

155. Complete a 200 level course in Linguistics with an emphasis on social diversity (e.g., how social groups distinguish themselves by language) with a grade of at least a B.

156. Complete a 300 level course in English with an emphasis on social diversity (e.g., study of U.S. folk culture) with a grade of at least a B.

157. Complete a 300 level course in Women's Studies with an emphasis on social diversity (e.g., violence in society against women) with a grade of at least a B.

158. Complete a 400 level course in Sociology with an emphasis on social diversity (e.g., relationship between religion and society) with a grade of at least a B.

159. Complete a 300 level course in Music with an emphasis on social diversity (e.g., music of ethnic groups) with a grade of at least a B.
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</table>

160. Complete a 200 level course in Anatomy and Physiology (e.g., study of human organ systems) with a grade of at least a B.

161. Complete a 100 level two course sequence in Physics (e.g., principles of magnetism) with a grade of at least a B.

162. Complete a 200 level course in Zoology (e.g., study of animal organ systems) with a grade of at least a B.

163. Complete a 100 level two course sequence in Geology (e.g., history of earth's life forms) with a grade of at least a B.

164. Complete a 100 level two course sequence in Biology (e.g., development of plants and animals) with a grade of at least a B.

165. Complete a 100 level two course sequence in Chemistry (e.g., chemical principles) with a grade of at least a B.

166. Complete a 200 level course in Geography (e.g., physical geographic structure of all world regions) with a grade of at least a B.

167. Complete a 200 level course in Linguistics (e.g., group language similarities) with a grade of at least a B.

168. Complete a 400 level course in Sociology (e.g., study of gender issues) with a grade of at least a B.

169. Complete a 100 level course in Political Science (e.g., introduction to capitalism) with a grade of at least a B.

170. Complete a 200 level course in International Studies (e.g., introduction to the history of Africa) with a grade of at least a B.

171. Complete a 200 level course in Anthropology (e.g., origins of human culture) with a grade of at least a B.
<table>
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<tr>
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172. Complete a 500 level course in Humanities in Philosophy (e.g., examination of equality) with a grade of at least a B.

173. Complete a 200 level course in Humanities in English (e.g., study of folklore) with a grade of at least a B.

174. Complete a 100 level course in Art (e.g., drawing) with a grade of at least a B.

175. Complete a 100 level two course sequence in History (e.g., history of war) with a grade of at least a B.

176. Complete a 300 level course in the History of Art (e.g., history of art in the modern world) with a grade of at least a B.

177. Complete a 200 level course in English (e.g., study of British writers) with a grade of at least a B.

178. Complete a 500 level Advanced Study course as a "Capstone" to a previous course in the Social Sciences with a grade of at least a B.

179. Complete a 500 level course in History with an emphasis on present day issues (e.g., the threat of war) with a grade of at least a B.

180. Complete a 500 level course in Sociology with an emphasis on present day issues (e.g., world population problems) with a grade of at least a B.

181. Complete a 500 level course in Political Science with an emphasis on present day issues (e.g., economic development of industrialized nations) with a grade of at least a B.

182. Complete a 500 level course in Social Work with an emphasis on present day issues (e.g., adolescent parenthood) with a grade of at least a B.

183. Complete a 500 level course in Landscape Architecture with an emphasis on present day issues (e.g., environmental concerns) with a grade of at least a B.
<table>
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<tr>
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</table>

184. Earn a cumulative grade point average of at least a C after two years of study.

185. Earn a cumulative grade point average of at least a C after three years of study.

186. Gain admission to your first-choice college major.

187. Complete the requirements for your academic major with a grade point average of at least a B.

188. Excel at OSU over the next quarter.

189. Excel at OSU over the next two quarters.

190. Excel at OSU over the next three quarters.

191. Graduate from OSU.
APPENDIX B

THE INVENTORY OF LEARNING PROCESSES
Inventory of Learning Processes

Your responses to the items in this questionnaire are to be recorded as either TRUE or FALSE on the computer answer sheet. If a particular statement applies to you, mark the first space (A) to indicate a response of TRUE. If a particular statement does not apply to you, mark the second space (B) to indicate FALSE. There are no right or wrong answers, so respond quickly to each item and be honest.

1. When studying for an exam, I prepare a list of probable test questions and answers.

F 2. I have trouble making inferences.

3. I find that I concentrate on memorizing a lot of what we have to learn.

4. I increase my vocabulary by building lists of new terms.

5. I am very good at learning formulas, names, and dates.

6. New concepts rarely make me think of many other similar concepts.

7. Even when I feel I've learned the material, I continue to study it.

F 8. I have trouble organizing the information that I remember.

F 9. Even when I know I have carefully learned the material, I have trouble remembering it for an exam.

10. I usually don't have time to think about the implications of what I read.

11. I make simple charts and diagrams to help me remember material.

12. I rarely write an outline of the material I read.

13. I do not try to convert facts into "rule of thumb."

14. I do well on tests requiring definitions.

15. Professors seem to delight in making the simple truth unnecessarily complicated.
If a particular statement applies to you, mark the first space (A) to indicate a response of TRUE. If a particular statement does not apply to you, mark the second space (B) to indicate FALSE.

16. I usually refer to several sources in order to understand a concept.
T

17. I try to resolve conflicts between the information obtained from different sources.

18. I learn new words or ideas by visualizing a situation in which they occur.

19. I spend less time studying than most of my friends.

20. I learn new concepts by expressing them in my own words.
F

21. I often memorize material I don’t understand.

22. For exams, I memorize the material as given in the text or class notes.

23. I carefully complete all course assignments.
F

24. I have difficulty planning work when confronted with a complex task.

25. I "debate" with material as I study it.

26. I remember new words and ideas by associating them with words and ideas I already know.

27. I review course material periodically during the quarter.
F

28. I often have difficulty finding the right words for expressing my ideas.

29. Toward the end of a course, I prepare an overview of all material covered.
T

30. I can easily handle question requiring comparison of different concepts.

31. I rarely read beyond what is assigned in class.
F

32. I have difficulty learning how to study for a course.

33. I rarely sit and think about a unit of material which I have just read.
If a particular statement applies to you, mark the first space (A) to indicate a response of TRUE. If a particular statement does not apply to you, mark the second space (B) to indicate FALSE.

34. I try to relate ideas in one subject to those in others whenever possible.

35. I have a regular place to study.

T 36. I read critically.

37. I "daydream" about things I've studied.

38. I do poorly on completion items.

39. I rarely use a dictionary.

40. Although I generally remember facts and details, I find it difficult to fit them together into an overall picture.

41. I learn new ideas by relating them to similar ideas.

42. When learning a unit of material, I usually summarized it in my own words.

43. I maintain a daily schedule of study hours.

T 44. I think fast.

45. While learning new concepts, their practical implications don't usually come to mind.

T 46. I get good grades on term papers.

47. Puzzles and problems fascinate me, particularly when you have to work through the material to reach a logical conclusion.

48. Getting myself to begin studying is usually difficult.

49. I have difficulty locating particular passages in textbook when necessary.

T. 50. I can usually formulate a good guess even when I don't know the answer.

51. I have trouble remembering definitions.
If a particular statement applies to you, mark the first space (A) to indicate a response of TRUE. If a particular statement does not apply to you, mark the second space (B) to indicate FALSE.

52. I would rather read a summary of an article than the original article.

53. While studying, I attempt to find answers to questions I have in mind.

T 54. I can usually state the underlying message of films and readings.

55. I do not usually work through practice exercises and sample problems.

F 56. I find it difficult to handle question requiring critical evaluation.

57. When I rehearse something, I usually repeat it over and over to myself.

58. I have regular weekly review periods.

59. I do well on exams requiring much factual information.

F 60. Most of my instructors lecture too fast.

61. I rarely look for reasons behind the facts.

62. I cram for exams.

63. I find that I remember things best if I concentrate on the order in which the lecturer presented them.

64. When I study something, I devise a system for recalling it later.

F 65. I have trouble seeing differences between apparently similar ideas.

66. I always make a special effort to get the details.

67. I prepare a set of notes integrating the information from all sources in a course.

68. My memory is actually pretty poor.

69. I am rarely able to design procedures for solving problems.
If a particular statement applies to you, mark the first space (A) to indicate a response of TRUE. If a particular statement does not apply to you, mark the second space (B) to indicate FALSE.

T  70. I do well on essay tests.

71. I rarely use the library.

SYMBOL IDENTIFICATION

Items with T or F represent the 18 items of the Deep Processing Scale.

T: indicates use of deep processing if the item is answered true.

F: indicates use of deep processing if the item is answered false.
APPENDIX C

THE APPROACHES TO STUDYING INVENTORY
The Approaches to Studying Inventory

After reading each statement in this questionnaire, select one of the five alternatives described below which best represents your immediate reaction. Mark the letter on the answer sheet which corresponds to the alternative you choose.

A = Definitely agree
B = Agree with reservations
C = Item does not apply to you or it is impossible to give definite answer
D = Disagree with reservations
E = Definitely disagree

72. I find it difficult to organize my study time effectively

73. X I try to relate ideas in one subject to those in others, whenever possible.

74. Although I have a fairly good general idea of many things, my knowledge of the details is rather weak.

75. I enjoy competition: I find it stimulating.

76. X I usually set out to understand thoroughly the meaning of what I am asked to read.

77. Ideas in books often set me off on long chains of thought of my own, only tenuously related to what I was reading.

78. I choose my present courses mainly to give me a chance of a really good job afterwards.

79. Continuing my education was something which happened to me, rather than something I really wanted for myself.

80. I like to be told precisely what to do in essays or other assignments.

81. X I often find myself questioning things that I hear in lectures or read in books.

82. I generally prefer to take each part of a topic or problem in order, working out one at a time.

83. The continual pressure of work—assignments, deadlines and competition—often makes me tense and depressed.
A = Definitely agree  
B = Agree with reservations  
C = Item does not apply to you or it is impossible to give definite answer  
D = Disagree with reservations  
E = Definitely disagree  

84. I find it difficult to "switch tracks" when working on a problem: I prefer to follow each line of thought as far as it will go.  
85. My habit of putting off work leaves me with far too much to do at the end of the term.  
86. It's important to me to do really well in the courses here.  
87. Lecturers seems to delight in making the simple truth unnecessarily complicated.  
88. Distractions make it difficult for me to do much effective work in the evenings.  
89. When I'm doing a piece of work, I try to bear in mind exactly what that particular lecturer seems to want.  
90. I usually don't have time to think about the implications of what I have read.  
91. Lecturers sometimes give indications of what is likely to come up in exams, so I look out for what may be hints.  
92. In trying to understand a puzzling idea, I let my imagination wander freely to begin with, even if I don't seem to be much nearer a solution.  
93. My main reason for being here is that it will help me to get a better job.  
94. Often I find myself wondering whether the work I am doing here is really worthwhile.  
95. I generally put a lot of effort into trying to understand things which initially seem difficult.  
96. I prefer courses to be clearly structured and highly organized.  
97. A poor first answer on an exam makes me panic.
A = Definitely agree  
B = Agree with reservations  
C = Item does not apply to you or it is impossible to give definite answer  
D = Disagree with reservations  
E = Definitely disagree

98. I prefer to follow well tried approaches to problems rather than anything too adventurous.

99. I am rather slow a starting work in the evenings.

X 100. In trying to understand new ideas, I often try to relate them to real life situations to which they might apply.

101. When I'm reading I try to memorize important facts which may come in useful later.

102. I like to play around with ideas of my own even if they don't get me very far.

103. I generally choose courses more from the way they fit in with career plans than from my own interests.

X 104. I am usually cautious in drawing conclusions unless they are well supported by evidence.

X 105. When I'm tackling a new topic, I often ask myself questions about it which the new information should answer.

106. I suppose I am more interested in the qualifications I'll get than in the courses I'm taking.

107. Often I find I have to read things without having a chance to really understand them.

108. If conditions aren't right for me to study, I generally manage to do something to change them.

X 109. In reporting practical work, I like to try to work out several alternative ways of interpreting the findings.

X 110. My main reason for being here is so that I can learn more about the subjects which really interest me.

111. In trying to understand new topics, I often explain them to myself in ways that other people don't seem to follow.
A = Definitely agree
B = Agree with reservations
C = Item does not apply to you or it is impossible to give definite answer
D = Disagree with reservations
E = Definitely disagree

112. I find I have to concentrate on memorizing a good deal of what we have to learn.

113. It is important to me to do things better than my friends, if I possibly can.

114. I find it better to start straight away with the details of a new topic and build up an overall picture in that way.

115. Often when I'm reading books, the ideas produce vivid images which sometimes take on a life of their own.

116. One way or another I manage to get hold of books I need for studying.

117. I often get criticized for introducing irrelevant material into my essays or tutorials.

118. I find that studying academic topics can often be really exciting and gripping.

119. The best way for me to understand what technical terms mean is to remember the text-book definitions.

120. I certainly want to pass the next set of exams, but it doesn't really matter if I only scrape through.

121. I need to read a subject pretty widely before I'm ready to put my ideas down on paper.

122. Although I generally remember facts and details, I find it difficult to fit them together into an overall picture.

123. I tend to read very little beyond what's required for completing assignments.

124. Having to speak in help sessions is quite an ordeal for me.

125. Puzzles or problems fascinate me, particularly where you have to work through the material to reach a logical conclusion.
A = Definitely agree  
B = Agree with reservations  
C = Item does not apply to you or it is impossible to give definite answer  
D = Disagree with reservations  
E = Definitely disagree

X 126. I spend a good deal of my spare time in finding out more about interesting topics which have been discussed in classes.

X 127. I find it helpful to 'map out' a new topic for myself by seeing how the ideas fit together.

128. I seem to be a bit too ready to jump to conclusion without waiting for all the evidence.

129. I hate admitting defeat, even in trivial matters.

130. I think it is important to look at problems rationally and logically without making intuitive jumps.

131. I find I tend to remember things best if I concentrate on the order in which the lecturer presented them.

X 132. When I'm reading an article or research report, I generally examine the evidence carefully to decide whether the conclusion is justified.

133. Professors, teaching assistants and tutors seem to want me to be more adventurous in making use of my own ideas.

134. When I look back, I sometimes wonder why I ever decided to come to college.

X 135. I find academic topics so interesting, I should like to continue learning about them after I finish this course.

SYMBOL IDENTIFICATION

X: indicates items making up the Meaning Orientation Scale
LIST OF REFERENCES


