KNOWLEDGE MONITORING, GOAL ORIENTATIONS, SELF-EFFICACY, AND ACADEMIC PERFORMANCE: A PATH ANALYSIS

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The purpose of this study was to examine the relationship between knowledge monitoring and motivation as defined by self-efficacy and goal orientations. A path model was proposed to hypothesize the causal relations among predictors of the students’ total score in the Educational Psychology course. A correlational design was used for the current study. The sample consisted of undergraduate students enrolled in two sections of the Educational Psychology course at Kent State University. The data collection process took place during two semesters (Fall 2010 and Spring 2011). Subjects completed the knowledge monitoring accuracy (KMA) and combined scale of self-efficacy and goal orientations online. Students’ total exam score was used to operationalize academic performance. One instructor taught the Educational Psychology course during both semesters.

Results of the study confirmed the positive correlations between knowledge monitoring, self-efficacy, mastery goals, and total exam score. The path analysis revealed that two predictors had significant direct effects on total score, knowledge monitoring ($\beta = .308$) and mastery goals ($\beta = .231$). Self-efficacy had a significant direct effect on mastery goals ($\beta = .456$). Although self-efficacy significantly correlated with total score, the parameter between self-efficacy and total score was not significant ($\beta = .071$). Knowledge monitoring did not significantly correlate with self-efficacy and
mastery goals. The path analysis revealed no significant exogenous parameters from or to performance goals.

The current study provided some insights in understanding the relationship between knowledge monitoring and motivation as defined by self-efficacy and goal orientations. Recommendations and suggestions for future research were discussed.
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CHAPTER I
INTRODUCTION

Metacognition emerged as a construct in the 1970s. Flavell (1979) described metacognition as learners’ knowledge of their own cognition, defining it as “knowledge and cognition about cognitive phenomena” (p. 906). A good deal of research has supported the importance of metacognition within educational contexts. Evidence supports the conclusion that students with good metacognition demonstrate higher academic performance when compared to students with poor metacognition (e.g., Bembenutty, 2007; Lan, 1996; Pintrich & DeGroot, 1990; Vrugt & Oort, 2008). Flavell (1979) proposed that schools are the source of metacognitive development because of the opportunities they offer for learning. Similarly, Paris and Winograd (1990) argued that students’ learning can be enhanced by becoming aware of their own thinking as they are involved in different learning activities.

Tobias and Everson (2002) drew particular attention to knowledge monitoring as a fundamental or prerequisite metacognitive process. Knowledge monitoring as described by Tobias and Everson (2009) is the ability to monitor prior knowledge or what has been learned previously in a particular academic domain. Tobias and Everson (2000a, 2000b, 2002) argued that students’ ability to differentiate between what they know and do not know is central to learning effectively from instruction. They argued that if students fail to differentiate what they know from what they do not know, they cannot be expected to engage more advanced metacognitive strategies, such as evaluating their learning or employing more efficient learning strategies.
Despite decades of research on metacognition, more research is needed to investigate different components of metacognition and the relationship of metacognition to other variables within learning contexts. Perhaps a greater understanding can be found in the potential relationship between knowledge monitoring and motivational variables. Although the corpus of research in the area of metacognition has hypothesized a significant relationship between metacognition and motivation (e.g., Harrison, 1991; Heils & van Kraayenoord, 2003; Yunus & Ali, 2008), only a limited amount of research has explored the potential existence of a significant relationship between components of metacognition and motivational variables, such as self-efficacy and goal orientations (Coutinho, 2008; Tobias, Galvin, & Michna, 2002). Understanding these relationships may help educators to identify students in the classroom who are metacognitively aware but not highly motivated to succeed academically, or perhaps more important, the student who wants to learn but struggles with metacognition, and thus help the educator to select the best solutions for their students. Such solutions may include attempting to enhance students’ motivation or promoting more effective learning strategies that may enhance students’ metacognition.

**Motivational Variables**

Self-efficacy and goal orientations were among the variables investigated in the current study. One might question why self-efficacy and goal orientations, particularly, were used in the current research. There is a growing body of research literature demonstrating that self-efficacy is an important variable that influences students’ motivation and plays a critical role in students’ performance (Al-Harthy, Was, &
Isaacson, 2010; Andrew, 1998; Bandura, 1993; Barkly, 2006; Paulsen & Gentry, 1995; Schunk, 1981, 1989; Zimmerman, 2000). Academic self-efficacy refers to students’ beliefs about their ability to perform academic tasks at designated levels (Schunk, 1991). Bandura (1977) defined perceived self-efficacy as personal judgments of one’s capabilities to organize and execute actions to attain designated goals. Bandura (1993) argued that different motivational theories were built around three different forms of motivation: causal attributions (attribution theory), outcome expectancies (expectancy-value theory), and academic goals (achievement goal theory). Bandura also contended that beliefs of self-efficacy operate in all of these motivational forms. More specifically, students with high self-efficacy attribute their failures to a lack of effort, whereas those with low self-efficacy attribute their failures to a lack of ability (Bandura 1993; Collins, 1982). Bandura (1993) concluded that “casual attributions affect motivation, performance, and affective reactive reactions mainly through beliefs of self-efficacy” (p. 128).

According to expectancy-value theory, motivation is governed by two stable and situational factors. A student’s motivation to approach a task is determined by an unconscious stable factor (motive for success) and two conscious situational factors (probability and value of success). Conversely, a student’s tendency to avoid a task is determined by an unconscious stable factor (motive to avoid failure) and two conscious situational factors (probability and value of failure). In this theory, the two unconscious motivational tendencies are represented as opposing forces. The resultant tendency to approach or avoid an achievement activity is a function of the strength of the tendency to
approach, minus the strength of the tendency to avoid the task (Stipek, 2002). Bandura (1993) held that students depend on their beliefs about what they can do, and about the likely outcomes of performance. Furthermore, he explained that the motivating potential that the outcome expectancies can offer is partly governed by students’ beliefs concerning their capabilities. He concluded that “the productiveness of expectancy-value theory is enhanced by including the self-efficacy determinant” (p. 130).

Goal orientation is the other motivational factor that was included in the current study. As described by Dowson and McInerney (2001), and based on achievement goal theory, goals are defined as “cognitive representations of the different purposes students may adopt for their learning in achievement situations” (p. 35). In the present study, goal orientation is considered an important component of motivation. Bandura (1993) argued that motivation involves cognitive comparison processes and these processes are produced based on the goals students set for their learning. The comparison processes differ as per different goals. He argued that by making self-satisfaction conditional on matching adopted goals, students set directions for their behaviors in order to accomplish their goals. In addition, research conducted by Elliot and Church (1997) has demonstrated that when achievement goals are taken into account, achievement motivation (desire to succeed) has no residual effect. Motives may “arouse or activate certain types of goals, but the goals then serve to guide and direct behavior and achievement” (Pintrich & Maehr, 2001, p. 16, as cited in Bandura, 1993). Given this, it can be concluded that goal orientations affect students’ motivation by providing standards from which self-satisfaction is drawn.
Goal Orientations Framework

Recently, we have seen a convergence of theory and research around the constructs of mastery and performance goals (see Elliot, 2005; Was, 2006 for reviews). These goals represent two different ways of pursuing competence in achievement situations (Ames, 1992; Dweck & Leggett, 1988; Nicholls, 1989). Mastery goals orientation focuses on the development of competence, task mastery, self-referential standards, and on learning and the development of skills. The performance-approach goals orientation is directed toward attaining favorable judgments of competence and is oriented to demonstrate that one is more capable than his or her peers. Of course, not all students set positive goals in the classroom; therefore, theorists have also identified a performance-avoidance goals orientation, which focuses on effort minimization to protect self-worth. For example, a student who is performance-avoidance oriented may produce less effort in certain tasks to avoid social judgment, which might reveal that s/he is less capable than her or his peers.

Purpose of the Study

The main focus of this study was to investigate the relationships between knowledge monitoring, the motivational variables as defined by self-efficacy and goal orientations, and academic performance. A trichotomous framework was used at the beginning of the study to define goal orientations. However, the findings from principal component analysis (discussed in the Results section) showed the prevalence for a dichotomous framework. The trichotomous framework divides goal orientations into three goals: mastery, performance-approach, and performance-avoidance goals. The
independent variables in the current study were knowledge monitoring, self-efficacy, and goal orientations. The dependent variable was academic performance. The current study was designed to examine the relationship of each of the independent variables with the dependent variable. Utilizing logic and theory, the current investigation focused on developing a causal model for explaining students’ academic achievement. To fulfill the goals of this study, participants’ knowledge monitoring accuracy was measured and correlated to their self-efficacy, goal orientations, and academic performance. In addition, this study aimed to investigate how self-efficacy and goal orientations might mediate the relationship between knowledge monitoring and academic performance. A central hypothesis of the study was that the motivational variables (self-efficacy and goal orientations) would mediate the relationship between knowledge monitoring and academic performance. In addition, it was hypothesized that students with high self-efficacy will perform better than students with low self-efficacy. Furthermore, mastery and performance-approach oriented students were hypothesized to perform better than performance-avoidant students. Also, it was my hypothesis that individuals possessing accurate knowledge monitoring will perform better than those with inaccurate knowledge monitoring. More specifically, accurate knowledge monitors were hypothesized to have higher self-efficacy and adopt mastery and performance-approach goals.
Operational Definitions

Academic Self-Efficacy

Self-efficacy was measured by the self-efficacy subscale of the “Patterns of Adaptive Learning Survey (PALS)” (Midgley et al., 2000).

Achievement Goal Orientations

Students’ goals were measured by the goal orientation subscale of the “Patterns of Adaptive Learning Survey (PALS)” (Midgley et al., 2000).

Knowledge Monitoring Accuracy

A version of the knowledge monitoring assessment (KMA) (Isaacson & Was, 2010; Tobias & Everson, 1995) was adapted to measure knowledge monitoring accuracy.

Academic Performance

Academic performance was measured by the sum of students’ exam scores in an Educational Psychology course.

Research Questions

The primary research questions guiding the proposed research include:

- What is the unique contribution of each of the predictor variables on the variability in the mean total exam score for undergraduate students enrolled in the Educational Psychology course at Kent State University?

- Is the effect of knowledge monitoring on the mean total exam score dependent on the self-efficacy and goal orientations of undergraduate students enrolled in the Educational Psychology course at Kent State University?
- Is the hypothesized model that describes the causal effects among the variables “knowledge monitoring accuracy,” “self-efficacy,” “goal orientations,” and “students’ performance” consistent with the observed correlations among these variables?

- If the model is consistent, what are the estimated direct, indirect, and total causal effects among the variables
CHAPTER II

REVIEW OF THE LITERATURE

Self-Efficacy

The first variable of interest in the proposed study was self-efficacy. Before discussing self-efficacy, it is important to briefly describe social cognitive theory. The cognitive side of social cognitive theory of motivation is evident in the expectations, cognitive processing, and awareness of response-consequence contingencies. Bandura’s (1977) social cognitive motivational theory states that people interpret events and develop expectations about reinforcement. These interpretations and expectations, then, affect their behavior. Bandura (1993) emphasized the importance of personal evaluation as positive reinforcement. He claimed that most people value the self-respect and the self-satisfaction derived from a job well done more highly than they value material rewards. As such, achieving personal goals and experiencing the accompanying self-satisfaction can serve effectively as reinforcement. Furthermore, Bandura argued that the cognitive representations of behavior and its consequences guide future behavior. For example, children in a classroom in which the teacher dismisses the quietest student first may quiet down quickly before recess in the future because they have a cognitive representation of the teacher’s reaction to a quiet group of students.

Bandura argued that motivation is one of four conditions that are essential for behavior to occur. More specifically, Bandura emphasized the role of two variables, self-efficacy and self-regulation, that affect individuals’ behaviors. Self-efficacy was one motivational variable investigated in the current study. Bandura (1977) defined
self-efficacy as personal judgments of one’s capabilities to organize and execute actions to attain designated goals. Bandura argued that people are more likely to engage in certain behaviors when they believe they are capable of executing those behaviors successfully. Academic self-efficacy refers to students’ beliefs about their ability to perform in academic tasks at designated levels (Schunk, 1991). Self-efficacy for learning involves assessing what will be required in the learning context and how well one can use knowledge to perform. In addition, self-efficacy has specific properties across activities and contexts; these properties are level, generality, and strength. The level of self-efficacy refers to its dependence on the difficulty of a particular task. Generality relates to transferability from one task to another, and the strength of self-efficacy is measured by the amount of one’s certainty about performing a given task (Zimmerman, 2000).

Self-efficacy affects behavioral functioning by influencing individuals’ choices of academic activities. Previous research indicates that the higher one’s perceived self-efficacy, the greater one’s continued involvement in the activities and subsequent achievements will be (Schunk, 1981). A non-experimental study conducted by Barkley (2006) investigated whether sixth, seventh, and eighth grade students’ efficacy beliefs were predictors of reading comprehension achievement as measured by a reading comprehension subtest score on the Stanford Achievement Test. The survey was designed to measure the students’ efficacy beliefs about four strategies that improve reading comprehension (prior knowledge, self-monitoring, cooperative learning, and using graphic organizers). Results demonstrated a positive correlation between subjects’
efficacy beliefs about prior knowledge, self-monitoring, graphic organizers, and their reading comprehension achievement.

Another study conducted by Paulsen and Gentry (1995) examined the relationships among motivational variables (intrinsic and extrinsic goal orientations, task value, control of learning, test anxiety, and self-efficacy), cognitive learning-strategy variables (rehearsal, elaboration, and organization), self-regulation learning-strategy variables (time, study, and effort), and students’ academic performance (final grade) in an Introduction to Financial Management course. A total of 353 undergraduate students were asked to complete the Motivated Strategies for Learning Questionnaire (MSLQ: Pintrich, Smith, Garcia, & McKeachie, 1991). The researchers found that all motivational variables were significantly related to academic performance (final grade in the course). More interestingly, a path analysis demonstrated that the strongest predictor of performance was self-efficacy. In Paulsen and Gentry’s study, self-efficacy mediated the impact on performance of all motivational variables and partially mediated the effects of time, study, and effort regulation.

Findings from different studies conducted at the high school and the university levels have demonstrated the importance of self-efficacy as a predictor of students’ academic performance (Andrew, 1998; Bandura, 1993; Barkly, 2006; Paulsen & Gentry, 1995; Schunk, 1981, 1989; Zimmerman, 2000). A recent study also demonstrated that the influence of self-efficacy on academic performance is independent of students’ metacognitive ability (Coutinho, 2008). Unfortunately, no research has investigated the relationship between self-efficacy and metacognition components, particularly
knowledge monitoring. Investigating this relationship not only increases our understanding about students’ learning, but also helps scholars to evaluate cases in classroom settings in which students are highly motivated to learn but do not meet class performance requirements. The present study investigated the relationship between self-efficacy and knowledge monitoring.

**Achievement Goal Motivation Theory**

The achievement goals approach originated in the late 1970s and early 1980s with the work of Ames (1984), Dweck (1986), Maehr and Nicholls (1980), and Nicholls (1984), and has emerged as the most prominent account of individuals’ affect, cognition, and behavior in competence relevant settings. As defined in Dowson and McInerney (2001), goals are “cognitive representations of the different purposes students may adopt for their learning in achievement situations” (p. 35). In addition, goals also play a central role in social cognitive theory. Bandura (1993) suggested that one way to influence students’ behavior is to influence their goals. Most students set goals in academic situations they encounter; discrepancies between their goals and their accomplishments create self-dissatisfaction, which serves as an incentive for them to make an enhanced effort (Bandura, 1993). The feeling of satisfaction for achieving a goal serves as a reward, which then increases future effort. Self-motivation requires standards against which performance is evaluated. The motivational effects are not derived from the goals themselves, but rather from the fact that people evaluate themselves as part of their response to their own behaviors. In Bandura’s theory, goals specify the conditional requirements for positive self-evaluation.
Most research on achievement goals orientation has addressed two types of goals: mastery and performance goals. Mastery goals focus on the development of competence and task mastery (Ames & Archer, 1988). Students who adopt mastery goals in certain achievement contexts believe that competence develops over time through practice and effort. They choose tasks that maximize opportunities for learning, invest considerable effort in tasks, use learning strategies that promote comprehension of course material, evaluate their own performance in terms of the progress they make, persist in the face of failure, view errors as a normal and useful part of the learning process, and subsequently use their errors to help improve performance (Elliot, 1999).

The second type of goal is performance goals, which focus on the demonstration of competence relative to others. Students who adopt performance goals for learning believe that competence is a stable characteristic (Dweck, 1986). They choose tasks that maximize opportunities for demonstrating competence and avoid tasks that might make them look incompetent, invest the minimal effort needed to succeed, evaluate their own performance in terms of how they compare to others, view errors as a sign of failure and incompetence, give up easily when they fail and avoid tasks that have previously led to failure (Elliot, 1999; Nicholls, 1984; Somuncuoglu & Yildirim, 1999).

Although Elliot and his colleagues (Elliot, 1999; Elliot & Church, 1997; Elliot & Harackiewicz, 1996) have proposed a trichotomous achievement goal framework that represents a revision of the mastery-performance dichotomy, the distinction between the approach and avoidance measure was acknowledged by researchers early in the study of motivation. More specifically, theorists working with attribution and self-worth theory
made early use of the approach and avoidance distinction. For example, Weiner (1986, 1992) developed a cognitive interpretation of Atkinson’s theory, which contained Atkinson’s notion of approach (motive for success) and avoidance (motive to avoid failure) tendencies, the only difference being that Weiner used the language of attribution. In addition, Covington (1984, 1992), in his self-worth theory, asserted that students possess two independent achievement dispositions, success orientation and failure-avoidance orientation, that combine interactively to produce achievement behavior to feel competent or to avoid feeling incompetent.

In the trichotomous framework, the performance goals construct is divided into approach and avoidance components, and three independent achievement goals are defined: performance-approach goals focusing on the attainment of competence relative to others; performance-avoidance goals, focusing on the avoidance of incompetence relative to others; and mastery goals, focusing on the development of competence and task mastery. Each of these goals is hypothesized to lead to a unique pattern of achievement-relevant processes and outcomes.

Elliot (1999) also discussed a 2 x 2 achievement goals framework. He argued that like performance goals, mastery goals can be separated into approach and avoidance orientations. In the 2 x 2 achievement goals framework, there are four independent goals: mastery-approach, mastery-avoidance, performance-approach, and performance-avoidance. However, Elliot conceded that empirical data regarding mastery-avoidance goals were not available at the time, and that predictions are somewhat difficult to generate because of the two conceptions of these goals, which seem
to evoke a rather divergent set of processes. A second distinction in mastery orientation
is that of task-referential versus past-referential orientation. Past-referent students use
past performance as the measure of achievement, and as a scale by which to set new
goals, whereas mastery task-referent students measure their competence according to
whether they complete or fully understand the task at hand (Elliot, 1999).

There is a growing body of research investigating the impact of goal orientations
on student performance. As discussed below, this research includes a variety of
approaches to goal orientations. Recently, we have seen a convergence of theory and
research around goal orientations (see Elliot, 2005; Was, 2006 for reviews). These goals
represent different ways of pursuing competence in achievement situations as discussed
above. Not only has the relationship between goal orientations and academic
achievement been investigated, but also the relationships of these goals with other
theoretical constructs, such as self-efficacy, task value, and self-regulation, has received
great attention. Many studies have found that mastery goals are positively related to a
high sense of self-efficacy (Anderman & Young, 1994; Meece, Blumenfeld, & Hoyle,
1988; Middleton, Kaplan, & Midgley, 1998; Middleton & Midgley, 1997; Midgley &
Urdan, 1995; Roeser, Midgley, & Urdan, 1996; Skaalvik, 1997; Turner, Thorpe, &
Meyer, 1998; Wolters, Yu, & Pintrich, 1996). For example, Middleton and Midgley
(1997) examined the relationship between 703 sixth-graders’ self-efficacy,
self-regulation, academic goals and academic achievement in mathematics. They used
the trichotomous framework of goal orientations. Scales were adapted from Patterns of
Adaptive Learning Survey (PALS: Midgley et al., 1996) to measure mastery goals,
performance-approach goals, and academic efficacy. They also developed another scale to measure performance-avoidance goals. The self-regulated learning scale was adapted from measures developed by Pintrich, Smith, Garcia, and McKeachie (1991; as cited in Middleton and Midgley, 1997). Students’ academic achievement was computed on the basis of students’ final grade in math. The results demonstrated that mastery goals orientation was correlated with academic self-efficacy and reports of the use of self-regulated learning strategies. In contrast, performance-avoidance goals were negatively correlated with self-efficacy and positive predictors of test anxiety. Performance-approach goals did not significantly correlate with self-efficacy or self-regulated learning, which is consistent with other studies (e.g., Al-Harthy et al., 2010).

However, these results contradict other investigations in which the relationship between self-efficacy and performance-approach goals was found to be positive (Midgley & Urdan, 1995; Wolters et al., 1996). For instance, Wolters et al. (1996) investigated the relationship between goal orientations, motivational beliefs, self-regulation and the academic performance of seventh and eighth graders in four different subject areas (mathematics, English, social studies and science). They defined different components of goal orientations including learning goals, extrinsic goals and relative ability goal. Relative ability goal orientation was defined as students’ reflections of how strongly they adopted goals related to doing better than other students. The goal orientations scale was adapted from the PALS. The motivational beliefs included task value, self-efficacy, test anxiety, and cognitive strategy use, the last of which included organizational, rehearsal,
and elaboration strategies. Subscales from MSLQ were adapted to measure the motivational variables and self-regulation. Students’ grades in the four subject areas studied in the first and second semesters (Time 1 and Time 2) were collected from school records and were standardized within classrooms. The results demonstrated that learning goals, as well as relative ability goal orientation, were positively related to motivational beliefs, strategy use, and self-regulation, but not related to test anxiety. Quite interestingly, learning goals orientation did not strongly correlate with students’ grades in any of the four subjects during Time 1, whereas relative ability goal orientation positively predicted students’ task value, self-efficacy, performance and cognitive strategy, and self-regulatory strategy use. Moreover, the results of the Wolters et al. (1996) study demonstrated that learning goals orientation was the single best predictor of task value. This study produced results similar to those found in other research regarding the positive relationship between mastery goal orientations and the use of effective learning strategies (Ames & Archer, 1988; Anderman & Young, 1994; Nolen, 1988; Sankaran & Bui, 2001; Somuncuoğlu & Yildirim, 1999).

Investigating the relationship between self-efficacy, goal orientation and knowledge monitoring is clearly needed to determine the impact on students’ ability to learn. It would be useful to identify students who are accurate knowledge monitors, but not highly motivated to succeed academically.

**Metacognition**

Metacognition was introduced to the literature in the 1970s. Flavell (1979) set the stage for this construct by describing the developmental aspects of how one monitors or
thinks about one’s own cognition. Flavell described metacognition as learners’
knowledge of their own cognition, defining it as “knowledge and cognition about
cognitive phenomena” (p. 906). He went on to divide metacognition into four key areas.
These areas are: metacognitive knowledge, metacognitive experiences, goals, and
activation or strategies. First, metacognitive knowledge consists of one’s knowledge or
beliefs about different variables or factors that interact in some way to affect the
outcomes of cognition. These factors were divided into three major categories: person,
task and strategy. According to Flavell, a person possesses information about himself
and others and this information is divided into three subcategories. The first is
intra-independent differences, which refer to the information that an individual has about
him/herself. For example, one may say that “I learn better when studying in the library
than staying in the dorm.” The second subcategory is inter-independent differences,
which reflect the information an individual has about someone else. For example, a
student may say, “My friend is a better learner than I am.” The last subcategory is
universals of cognition. An example of this information might be when a student knows
that there are different types of learning strategies s/he can use to learn from a text.
According to Flavell, task is the second variable that affects the outcomes of cognition.
This category is divided into two subcategories: information available during cognitive
enterprise and task demands. He argued that metacognitive knowledge is an
understanding of the different options for how the task should be managed and how likely
each of them is to achieve the different goals that the task demands. The last variable is
strategy, which refers to choosing the best strategy to handle the task.
Metacognitive experience is the second area in metacognition as defined by Flavell (1979). This area has to do with an individual’s involvement in a cognitive enterprise and the progress one is making or is likely to make. Most importantly, he distinguished between metacognitive strategy and cognitive strategy. Metacognitive strategy aims to monitor cognitive strategy. For example, a student might ask, “Do I understand the content enough to pass the exam?” In this example, the student is trying to determine if he knows what he knows. Cognitive strategy, on the other hand, aims to make cognitive progress: for example, a student might spend more time reading on task to achieve a goal.

Although Flavell introduced the term “metacognition” based on the term “metamemory,” which he previously conceived (1979), he is not the only contributor to its conceptualization. In Social Learning Theory (SLT), which emerged in late 1970s, Bandura (1977) introduced self-regulation as one fundamental concept in his theory. According to SLT, self-regulation underlines behavioral and emotional regulation and emphasizes the reciprocal determinism of the environment on the person. For example, one’s self-regulation skills may require cognitive processes (such as evaluating performance) when s/he interacts with the environment. However, the act of self-regulation does not occur without the interaction of the person and the environment. Contrary to this, metacognition deals with reflective abstraction of new or existing cognitive structures. Metacognition emphasizes learner development over learner-environment interactions (Dinsmore, Alexander, & Loughlin, 2008). With the incorporation of self-regulation, a variety of definitions of metacognition began to
gradually expand from Flavell’s original conceptualization. In another instance, Baker and Brown (1984) provided another model of metacognition. In this model, metacognition was separated into two components: knowledge of cognition and regulation of cognition. Further, in this model the regulation of cognition includes planning and monitoring. Monitoring includes testing, revising and evaluating strategies. Knowledge monitoring is discussed in depth below.

Another model of metacognition was introduced by Cross and Paris (1988). They defined metacognition as “the knowledge and control children have over their own thinking and learning activities” (p. 131). In this model, two essential features are defined: self-appraisal and self-management of metacognition. Self-appraisal of cognition comprises reflections about an individual’s understanding, abilities, and effective state during the learning processes. Self-management refers to the actions and processes that people use to solve problems.

Schraw and Dennison (1994) defined metacognition as “the ability to reflect upon, understand, and control one’s learning” (p. 460). Eight components of metacognitive processes were identified and used in developing the Metacognitive Awareness Inventory (MAI). These components are declarative knowledge, procedural knowledge, conditional knowledge, planning, information management strategies, monitoring, debugging strategies, and evaluation of learning. Declarative knowledge refers to one’s knowledge about one’s skills, abilities, and factual knowledge concerning the topic at hand. Procedural knowledge refers to how one implements procedures.
Conditional knowledge refers to when to use learning procedures. Monitoring refers to the assessment of one’s learning and strategy use. Evaluation refers to the analysis of one’s performance and strategy used. Debugging strategies refers to the strategies used to correct comprehension and performance errors. Information management strategies refer to the strategy sequences used to process information more efficiently, whereas planning contains goal setting prior to learning.

Research indicates that metacognitively-aware learners are more strategic and perform better than unaware learners. The explanation is that metacognitive awareness allows learners to plan, sequence and monitor their learning in ways that improve performance. More than that, some researchers have emphasized that metacognition is more important than other variables in learning settings. For example, a study conducted by Swanson (1990) investigated whether high levels of metacognitive knowledge about problem solving could compensate for low overall aptitude. In this study, aptitude was defined as one’s propensity to successfully perform school-related tasks. Fifty-six children were administered a questionnaire to assess metacognition before administering the problem-solving tasks. The metacognition questionnaire was modified from Kreutzer, Leonard, and Flavell (1975) and Myers and Paris (1978). The children’s problem-solving ability was measured by using two tasks: the Pendulum and Combinatorial Tasks. Subjects were divided into four groups according to their aptitude and metacognitive abilities. These groups consisted of high aptitude-high metacognition (HAHM), high aptitude-low metacognition (HALM), low aptitude-high metacognition (LAHM) and low aptitude-low metacognition (LALM). The results demonstrated that
the high-metacognition group outperformed the low-metacognition group in problem solving regardless of their overall aptitude levels. The results showed that children in the LAHM group performed significantly better than those in the HALM group. Swanson argued that metacognitive knowledge allowed children in the LAHM group to perform in ways similar to high aptitude children. Swanson concluded that metacognition may have influenced specific forms of problem solving that general aptitude cannot. Swanson continued by stating that metacognitive knowledge substituted for an overall lack of aptitude by providing children with a domain-specific problem-solving skill.

The research discussed above investigated the area of metacognition in general as well as its relationship to performance. germane to the current study is research regarding the relationship between metacognition and motivation. A study conducted by Yunus and Ali (2008) investigated the relationship between motivation, metacognition, and mathematics performance. The participants were 195 final year students from four universities in Malaysia. Participants completed the Metacognitive Awareness Inventory (Schraw & Dennison, 1994) and a motivation questionnaire developed by O’Neil and Schacter (1997). The motivation questionnaire measured students’ effort, self-efficacy, and worry. Results demonstrated that motivation and metacognition significantly correlated with students’ achievement in mathematics. Students who had a high cumulative grade point average showed better use of metacognitive strategies. More importantly, this study revealed that the acquisition of certain aspects of metacognition was sufficient in helping students attain better performance. Yunus and Ali established that in problem-solving, one does not have to fully optimize all components of
metacognition; instead, declarative, procedural, and conditional knowledge were sufficient to help students solve problems in mathematics.

Heils and van Kraayenoord (2003) examined the interactions of reading, metacognition, and motivational variables related to reading in 59 students in grades seven and eight. Several measures were used to assess verbal skills. As cited in Heils and van Kraayenoord (2003), The Metacognitive Strategies Test (Schlagmuller & Schneides, 1999) was used to assess students’ ability to evaluate metacognitive strategies related to text recall; The Self-Perception of Reading (Nicholls, 1978) was used to assess students’ self-perception of reading skills; and The Interest in Reading Scale (van Kraayenoord, 1996) was used to assess students’ reading habits and attitudes toward reading. The results demonstrated that reading was accounted for by a combination of reading self-concept and metacognitive strategies. Students who were less interested (low motivation) in reading had weak metacognitive skills and lower performance.

The research discussed so far has provided insights into the general relationship between metacognition and performance, as well as between metacognition and motivation. A limited amount of research has explored the potential existence of a significant relationship between metacognition in general and motivational variables, such as self-efficacy. For example, a study conducted by Coutinho (2008) investigated the relationship between metacognition, self-efficacy, and students’ performance in an introductory psychology class. Coutinho’s main hypothesis was that the relationship between self-efficacy and performance is mediated by students’ metacognition abilities. Coutinho’s rationale behind this hypothesis was that students with strong faith in their
ability to successfully complete a task are likely to utilize metacognitive strategies to this end. Students’ efficacy beliefs were measured by nine items adapted from MSLQ (Pintrich, Smith, Garcia, & McKeachie 1993); students’ metacognition was measured by using the Metacognitive Awareness Inventory (MAI; Schraw & Dennison, 1994).

Positive relationships were found between self-efficacy and performance as well as between metacognition and performance. The results revealed that metacognition did not mediate the relationship between self-efficacy and students’ performance. However, when controlling for efficacy beliefs, the regression analysis for metacognition predicting student performance was non-significant. Coutinho’s study demonstrated that self-efficacy was a full mediator in the relationship between metacognition and student performance. In other words, the results demonstrated that the influence of self-efficacy on performance is independent of metacognition.

Knowledge Monitoring

Another view has defined metacognition as one’s ability to monitor, evaluate and make plans for one’s learning (Brown, 1980; Flavell, 1979; Tobias & Everson, 2000b). Tobias and Everson (2002) have followed Pintrich, Walters and Baxter (2000) in dividing metacognition into three distinct components. These components are knowledge about metacognition, the ability to monitor one’s learning processes, and the meta-ability to control learning processes. Knowledge monitoring is defined as one’s ability to monitor his/her learning by differentiating between the known and unknown (Tobias & Everson, 1996, 2000b, 2009; Tobias & Fletcher, 2000). It has been argued that knowledge monitoring is a fundamental or prerequisite metacognitive process (Tobias & Everson,
2009, 1996). The rationale for this assumption is that students’ effective control of their learning cannot occur in the absence of accurate knowledge monitoring. Tobias and Everson (2009) argued that knowledge monitoring is central to learning from instruction in school and in training settings in business, industry, and government. Based on description and analysis they have conducted 23 studies dealing with the knowledge monitoring component of metacognition assuming a hierarchical organization of metacognitive activities (Tobias & Everson, 1996, 2002). Tobias and Everson (2009) concluded that advanced metacognitive activities, such as evaluating learning, selecting appropriate learning strategies and planning for future learning activities, could not occur without accurate knowledge monitoring. Therefore, in the current investigation, the focus is on the monitoring component of metacognition.

The knowledge monitoring assessment (KMA) was developed to allow for precise measurement of students’ ability to monitor their prior learning, with an emphasis on the accuracy with which students distinguish between what they know from what they do not know (Tobias & Everson, 2000a). Within the KMA, subjects are presented with challenging academic tasks. These tasks could be word knowledge questions, mathematical equations, or verbal analogies, etc. Participants are required to estimate whether or not they know the material presented. For example, students are asked whether or not they know the definition of a word and are required to check “yes” or “no” indicating that they know or do not know the meaning of the word. After making these knowledge judgments, subjects are given a multiple-choice test on the same content. The measure of knowledge monitoring accuracy is the difference between
subjects’ knowledge judgments and their subsequent test performance. The KMA generates the following four scores, which reflect the relationship between subjects’ estimates of their knowledge and their test performance: 1) known and correctly identified on a subsequent test [hits]; 2) known, yet incorrectly identified on the test [false alarms]; unknown, yet correctly identified on the test [misses]; and 4) unknown and incorrectly identified on the test [correct rejections]. Two scores (hits and correct rejections) represent accurate metacognitive estimates of knowledge, while the other two scores (misses and false alarms) represent inaccurate knowledge monitoring estimates.

Previous research indicated that the students’ ability to accurately monitor their prior knowledge is highly related to reading achievement and academic achievement (Everson, Smidlaka, & Tobias, 1994; Tobias, Hartman, Everson, & Gourgey, 1991) and to mathematics achievement (Campione, Brown, & Connell, 1989). For the purpose of the current study, three studies that examined the relationship between knowledge monitoring and academic performance are discussed below.

Everson and Tobias (1998) conducted two studies to examine the relationship between knowledge monitoring and academic performance. In the first study, 84 college students were asked to complete a revised version of KMA that was developed by Everson et al., (1994). The KMA consisted of 38 words and a multiple choice test. Then two versions of the vocabulary task were randomly assigned to students followed by a re-administration of the KMA word list and vocabulary test. The students’ GPAs were obtained at the end of the first year. High and low-achievers were identified based on their GPAs. The analysis indicated that students above the median GPA (N = 48) made
significantly more accurate overall estimates of their knowledge on both KMA administrations than those below the median, whereas the mean differences between the high and low GPA groups on the vocabulary test were not significant. The results demonstrated that scores on knowledge monitoring more successfully differentiated the capable students from less capable students than did the raw vocabulary scores.

A study conducted by Slife, Weiss, and Bell (1985) investigated the metacognitive differences between learning disabled children and typically developing students on mathematical problem-solving skills. The subjects were 24 learning disabled students who were in the second to sixth grades and 24 typically developing students who were in the first to fifth grades. Each subject was administered the Comprehensive Tests of Basic Skills (CTBS). Learning disabled subjects were given a set of ten arithmetic problems. Each subject was given 10 seconds to look over the problem set and predict the number of problems that they would answer correctly. Then, the subjects solved the problems and were finally asked to identify those problems that were correct and those that were incorrect. The results indicated that the learning-disabled group was less accurate in their knowledge about their problem-solving skills and their prediction of the number of problems they would solve correctly was significantly less accurate than the other group. In addition, the learning-disabled group was less accurate in monitoring their problem-solving performance and their identification of which problems were right and wrong was significantly less accurate than the other group.

A recent study conducted by Isaacson and Was (2010) examined college students’ ability to monitor their prior knowledge and the relationship to their performance. A total
of 129 undergraduate students completed the KMA twice during the semester in their educational psychology course (first and last two weeks). The KMA consisted of 50 English words. The results revealed that the knowledge monitoring in both administrations (first and last two weeks) were related to the students’ performance on the final exam. This finding was replicated by a study conducted by Hartwig, Was, Isaacson, and Dunlosky (2011).

The research results presented above clearly indicated the importance of knowledge monitoring on learning and its influence on academic performance (Everson et al., 1994; Everson & Tobias, 1998; Hartwig et al., 2011; Isaacson & Was, 2010; Slife et al., 1985; Tobias, Everson & Laitusis, 1999). Nevertheless, to draw the conclusion that knowledge monitoring is an essential ability for human learning further research on its relationship with motivation is needed to determine and to fully understand its impact. One might inquire, “Why should this relationship be investigated?” The answer to this question comes from the research results that demonstrate the importance of motivation as an essential variable in any learning setting that affect students’ behaviors and eventually their academic performance (Meece, Anderman, & Anderman, 2006; Moore, 2007; Verkuyten, Thijs, & Canatan, 2001). Research has indicated that motivation initiates, directs, and maintains the activities controlling learning. However, Tobias and Everson (2009) argued that motivation can affect students’ learning only by engaging the metacognitive processes controlling it. In other words, highly motivated students who are willing to invest considerable effort to accomplish their academic goals are unlikely to be effective unless they also possess accurate knowledge monitoring skills. To
determine the validity of this assumption, knowledge monitoring accuracy was measured and its relationships with the motivational components self-efficacy, goal orientations, and academic performance were examined.

There is minimal extant research regarding the relationship between goal orientations and knowledge monitoring (however see Njoku, 2007; Stavrianopoulus, 2004, as cited in Tobias & Everson, 2009). Tobias et al. (2002) examined the relationship between knowledge monitoring, help seeking, and achievement goal orientations. A trichotomous framework of goal orientations was used, and subjects were asked to complete a questionnaire developed by Pintrich and Maehr (2001). A KMA consisting of 42 words was administered by computer. On the first 21 words, participants were asked to estimate their knowledge of each word and then were instructed to complete a multiple choice test on the words. During the first 21 words and after completing the test, subjects were also given the opportunity to request help on words either by receiving a definition or an example of the word used in a sentence. The procedures were identical during the second set of words, except that feedback about subjects’ answers on the test was provided before using the help request option. The results indicated that goal orientations had no effect on monitoring accuracy or on help seeking.

An experimental design was used in a doctoral dissertation conducted by Stavrianopoulus (2004, as cited in Tobias & Everson, 2009) to investigate the effects of motivational goals on metacognitive knowledge monitoring and help seeking. Participants received different instructions to induce a trichotomous framework of goal
orientations. Participants also completed a KMA consisting of 40 authentic vocabulary words and five nonsense words where they were able to request help with only ten words. Results indicated that goal orientations did not affect students’ knowledge monitoring accuracy.

Although the research results discussed above have shown that goal orientations have no effect on knowledge monitoring, a study conducted by Hartwig, Was, Isaacson, and Dunlosky (2009) showed a moderate negative correlation between monitoring accuracy and performance avoidance. Hartwig et al., (2009) conducted two studies investigating the relationship between knowledge monitoring, goal orientations, and academic performance. A total of 379 undergraduates who enrolled in an educational psychology course completed a KMA consisting of 50 English words, 33 of the words came from the text used for the course and 17 were general English vocabulary words. Participants also completed Elliot’s (1999) achievement goals items based on a trichotomous framework. Students’ course final exam scores represented students’ academic performance. The results demonstrated that monitoring accuracy predicted students’ performance on a final exam. More important, the effects knowledge monitoring had on students’ performance were partially mediated by only performance-avoidance goals. This study suggested that students who are performance avoidance oriented are poor monitors and consequently have lower performance.

The results introduced above are inconsistent with a doctoral dissertation conducted by Njoku (2007, as cited in Tobias & Everson, 2009). Njoku compared high school students from Nigeria to American students in knowledge monitoring ability.
Participants completed a KMA consisting of 24 mathematics word problems and a motivational goals questionnaire developed by Pintrich and Maehr (2001). The results showed that American students were more accurate knowledge monitors than Nigerian students. More important, the results demonstrated that mastery oriented students were more accurate at knowledge monitoring.

All reported research provided support for the predictions dealing with the positive relationship between knowledge monitoring and academic achievement; however, the previous research has failed to confirm expectations dealing with achievement goal motivation theory. In addition, no research was found that investigated the relationship between self-efficacy and knowledge monitoring. The goal of the current study was to develop a causal model for explaining students’ academic achievement. More specifically, this study investigated the causal effects among the following variables: knowledge monitoring accuracy, self-efficacy, achievement goal orientations, and students’ achievement. The hope was that the present study would contribute to the existing body of research on knowledge monitoring and clarify its relationship with academic performance by including self-efficacy and goal orientations in the model.

A strong positive relationship was expected between knowledge monitoring ability and students’ self-efficacy. The rationale behind this hypothesis was that research results indicated a high correlation between self-efficacy and metacognitive self-regulation skills (e.g., Al-Harthy et al., 2010). In addition, based on Bandura’s definition of self-efficacy, students with high self-efficacy usually engage in cognitive activities, such as personal judgments of their capabilities, assessment of what will be required and
how one performs in certain learning contexts. It has been argued that such cognitive activities could not occur without accurate knowledge monitoring (Tobias & Everson, 2002). Given that the ability to differentiate between what is known (learned) and unknown (unlearned) is an important ingredient for success in all academic settings, the proposed path model (Figure 1) represented the hypothesis that knowledge monitoring would predict academic self-efficacy and would have a strong effect on students’ final scores. Furthermore, since self-efficacy involves the use of the cognitive activities discussed above and has been demonstrated to be a strong predictor of students’ performance, the proposed path model (Figure 1) hypothesized that academic self-efficacy would mediate the relationship between knowledge monitoring and students’ performance.

The research conducted investigating the relationship between goal orientations and knowledge monitoring has not yet settled the debate regarding various causal effects in the model. The inconsistency in the results regarding the relationship between knowledge monitoring and goals implies more research is needed to study the effects of knowledge monitoring on students’ performance by adding goal orientations to the model. Utilizing logic and theory, the path model proposed is shown in Figure 1. To investigate the relationships in question, participants were asked to complete a knowledge monitoring assessment (KMA) and a combined questionnaire that measures self-efficacy and goal orientations. Accurate knowledge monitoring accuracy was expected to positively correlate to self-efficacy, mastery goals, performance-approach goals and academic performance, but negatively correlate to performance avoidance goals. More
important, the current study hypothesized that the effect of knowledge monitoring on students’ achievement is mediated by the motivational variables.

* Minus signs (-) represent a path hypothesized to be negative.

*Figure 1. Hypothesized Path Model.*
CHAPTER III

METHOD

Sample

The population of the current study was undergraduate students enrolled in the Educational Psychology courses at Kent State University. The participants were 125 undergraduate students enrolled in the Educational Psychology courses during the fall 2010 and the spring 2011. The Educational Psychology courses were taught by the same instructor.

Instruments

Achievement Goal Orientation

Subscales that measure Goal Orientations of Mastery, Performance-Approach, and Performance-Avoidance were adopted from Patterns of Adaptive Learning Scales (PALS: Midgley et al., 2000; see Appendix A). The achievement goal questionnaire was comprised of 14 items, five items each for mastery ($\alpha = .85$) and performance-approach ($\alpha = .89$) goal orientations and four items ($\alpha = .74$) measure performance-avoidance goals orientation. Items in the achievement goal questionnaire have been adapted to measure domain-specific goals in the Educational Psychology courses. For example, the first item on the Mastery Goals Orientation Scale, “It’s important to me that I learn a lot of new concepts this year,” was rephrased for the sample of the proposed study as, “It’s important to me that I learn a lot of new concepts in this class.” The second item, “One of my goals is to master a lot of new skills this year,” was rephrased as, “One of my goals is to master a lot of new skills in this class.” The third item, “It’s important to me that I
improve my skills this year,” was rephrased as, “It’s important to me that I improve my skills in this class.” The items that measure performance-approach and performance-avoidance goals remain the same. The subject responses were based on a five point Likert-type scale. Items on the scales were anchored at 1 = “Strongly disagree,” 2 = “Disagree,” 3 = “Somewhat agree,” 4 = “Agree,” and 5 = “Strongly agree.”

**Self-Efficacy**

A subscale that measures academic self-efficacy was adopted from PALS (Midgley et al., 2000; see Appendix B). The subscale consisted of five items (α = .78) that measure students’ perceptions of their competence to do their class work. Because the study aimed to measure domain-specific efficacy in the Educational Psychology course, one item has been rephrased to measure domain-specific efficacy. This item, “I’m certain I can master the skills taught in class this year,” was rephrased as, “I’m certain I can master the skills taught in class.” The other four items remained the same. The subjects’ responses were based on a five point Likert-type scale. Items on the scales are anchored at 1 = “Strongly disagree,” 2 = “Disagree,” 3 = “Somewhat agree,” 4 = “Agree,” and 5 = “Strongly agree.”

**Knowledge Monitoring Assessment (KMA)**

The KMA evaluates how well students distinguish between what they know and do not know by comparing their knowledge estimates to test performance. A version of the knowledge monitoring assessment (KMA) (Isaacson & Was, 2010; see Appendix C) was adapted to measure knowledge monitoring accuracy. This measure was modeled
after a measure developed by Tobias and Everson (1995). The KMA consisted of 50 English vocabulary words. Thirty-three of the vocabulary words were derived from the text used for the Educational Psychology course and 17 were general vocabulary words from the English language.

**Academic Performance**

Academic performance was measured by students’ total exam score in the Educational Psychology courses. Students’ grades were calculated as the sum of 12 exams worth 100 points each. The students were administered one exam per week for the period of 12 weeks.

**Research Design**

This study examines the relationship between knowledge monitoring and specific motivational variables. The motivational variables were self-efficacy and achievement goal orientations. The current study investigated whether individual differences in knowledge monitoring accuracy predict individual differences in motivational variables. The appropriate research design for this, an individual differences study, was a correlational design. The correlation study is ex-post facto research, which focuses on the relationship between variables as they occur in natural settings. Neither random assignments nor control groups were applied in this study.

**Procedures**

The data collection for the current study took place during two academic semesters (Fall 2010 & Spring 2011). During the first week of each semester, participants were given written information regarding the purpose of the study. The
information included that they are participating in a study concentrating on students’
estimates of what they know, how they perform and how this is related to some
motivational variables. Participants were required to confirm their participation by
signing consent forms and were instructed to complete the KMA online during the first
two weeks of the semester in their Educational Psychology course. During the
administration of the KMA, participants were presented with 50 English vocabulary
words one at a time. They were asked to estimate whether they could or could not define
the word by checking “know” or “don’t know”. The second part of the KMA consisted
of a multiple choice vocabulary test, which was administered to the participants after they
finished the first part. During the second part of the KMA, the same 50 vocabulary
words as in the first part were presented. Participants were introduced with the
vocabulary item and five possible definitions for each word and were instructed to check
the word that best defines the word on the screen.

The Achievement Goal Orientations scale (14 items) and Self-Efficacy scale (5
items) were combined in one questionnaire, which was completed online. Participants
were instructed to indicate the extent to which they believe each item to be true on a 1
(strongly disagree) to 5 (strongly agree) scale.

The total exam score for the course was composed of students’ scores on 12
exams worth 100 points each. The exams were administered one per week. Students’
scores on the 12 exams were summed to calculate students’ total score in the Educational
Psychology course.
Analysis

Schraw (2009) discussed different outcome measures used to capture monitoring accuracy and these measures provide different types of information. Schraw brought attention to the importance of appropriately using these measures to answer research questions. Measures of relative accuracy focus on the trend in confidence judgments relative to trend in performance outcomes rather than on the precision of item specific judgments (Schraw, 2009). The KMA captures how an individual can discriminate better-learned materials from lesser-learned materials. More specifically, the current study aimed to capture the participants’ consistency between their confidence judgments and their actual performance outcomes on the vocabulary test, not on the degree to which each confident judgment is precise on an item-to-item basis. In addition, it has been recommended to use Goodman-Kruskal’s Gamma correlation (Goodman & Kruskal, 1954) for the measure of knowledge monitoring when categorical data in a 2 x 2 data is used (Schraw, 2009). The Gamma coefficient (Goodman & Kruskal, 1954) is based on discrepancies among the multiplicative values that lead to corresponding differences in the interpretation of the measures. Thus, for the purpose of this study, a measure of relative accuracy is the appropriate outcome measure. The Gamma coefficient (Goodman & Kruskal, 1954) was calculated for each participant in order to examine the overall relationship between the participants’ performance in the Educational Psychology course and knowledge monitoring.

All data were entered into the Statistical Package for the Social Sciences (SPSS) for analysis. Correlation and path analyses were used to investigate the relationship
between all variables as well as to assess the unique contribution of each predictor on the variability in students’ total score. Path analysis utilizes multiple regressions to estimate direct and indirect causal relations among several variables. This analysis allows for testing the acceptability of the causal model hypothesized in the current study (Mertler & Vannatta, 2005).

The endogenous variable for the proposed study was the students’ performance, which was measured by using participants’ total exam score in the Educational Psychology courses. Five exogenous variables were presented in the proposed path model (Figure 1). These exogenous variables were knowledge monitoring, self-efficacy, mastery goals, performance-approach goals, and performance avoidant goals.

**Delimitation**

The present study was limited by the research design. First, only students enrolled at the undergraduate-level were used in this investigation. Therefore, results may not establish a generalization beyond undergraduate-level students. Secondly, undergraduate students who were used in this investigation attended Kent State University. Consequently, the results may not generalize to undergraduate students at other undergraduate institutions.

**Limitations**

A primary source of data in the present investigation involved students’ self-reported responses to two instruments (KMA and PALS). Tobias and Everson (2009) argued that the KMA is partially a performance-based measure; thus, using the KMA was not a concern. However, forced-choice questions cannot fully represent
students’ responses to self-efficacy and goal orientations. It has been argued that social desirability in responding is a potential concern when conducting survey research (Brophy, 2005; Jan & Hall, 2005; Pintrich, Conley, & Kempler, 2003). However, it is likely that these dynamics were minimized since none of the participants had a relationship with the researcher, and students did not provide their identities to the researcher. Finally, the study sample was drawn only from undergraduate students enrolled in the undergraduate-level Educational Psychology course at Kent State University, which therefore involved non-random sampling. Participation was voluntary, and some students who decided not to participate potentially represented a sub-population that was not included in this investigation.
CHAPTER IV

RESULTS

The goal of this study was to investigate the relationship among knowledge monitoring, self-efficacy, goal orientations, and academic achievement as measured in students’ total score in the Educational Psychology course at Kent State University. Before describing the relations among the variables in the model, it is important to explain how the variables were computed. To start with, knowledge monitoring accuracy was measured by obtaining a gamma coefficient ($\gamma$). The formula below shows how the gamma coefficient ($\gamma$) was calculated. Table 1 presents the four possible outcomes that were used to compute a gamma coefficient ($\gamma$). Two scores (hits and correct rejections) represent accurate knowledge monitors, while the other two scores (misses and false alarms) represent inaccurate knowledge monitors. To compute monitoring accuracy, each response was assigned to one of the four categories (possible outcomes). Based on the frequency of responses in each of the four categories, a gamma coefficient ($\gamma$) was calculated for each participant. As mentioned in Schraw (2009), the Gamma coefficient was developed by Goodman and Kruskal (1954) and it is a non-parametric measure of association that ranges from -1.0 to 1.0. Large positive $\gamma$ value indicates a strong relationship between feeling-of-knowing judgments and testing performance, whereas values close to zero indicate no relationship and a large negative value inverse relationship.
Gamma coefficient ($\gamma$) = \[
\frac{(\text{hit}) \text{ (correct rejection)} - (\text{miss}) \text{ (false alarm)}}{(\text{hit}) \text{ (correct rejection)} + (\text{miss}) \text{ (false alarm)}}
\]

Table 1: Knowledge Monitoring Possible Scores.

<table>
<thead>
<tr>
<th></th>
<th>Know</th>
<th>Don’t Know</th>
</tr>
</thead>
<tbody>
<tr>
<td>Correct</td>
<td>Hit</td>
<td>Miss</td>
</tr>
<tr>
<td>Incorrect</td>
<td>False Alarm</td>
<td>Correct Rejection</td>
</tr>
</tbody>
</table>

The motivational variables as defined by self-efficacy and goal orientations were scored by summing item responses in each dimension of the factor model. For example, the self-efficacy score for one participant was computed by summing the participant’s responses to five items (7, 11, 14, 16, 18) that measure self-efficacy. Prior to the analysis, participants’ responses were screened for the accuracy of data entry, missing values, outliers, normality, multicollinearity, and homoscedasticity.

Data Screening and Assumptions

Accuracy of Data Entry and Missing Values

After participants’ scores in measured variables were matched using students’ ID, the data were available from responses of 144 participants on 19 items assessing self-efficacy and each of the three goal orientations. Also, the data were available from 140 participants on knowledge monitoring assessment and from 144 participants on total score. Not all of the students completed all measures and therefore there were missing data. The frequency distribution of each item showed four missing values in the following variables: self-efficacy, mastery goal, performance goal, and total score. After calculating gamma, eight missing values were found. As suggested by Tabachnich and
Fidell (2007), these missing values were profitably dropped from the analysis since they were not scattered throughout cases and variables. List-wise deletion method was utilized when running analysis and no analysis was completed with less than 125 participants.

**Outliers**

Tabachnich and Fidell (2007, p 73) reported that “Cases with standardized scores in excess of 3.29 ($p < .001$, two-tailed test) are potential outliers.” Examining the outliers using this criterion, cases 27, 42, 74, 81, 95, 99, and 109 were identified as outliers and were deleted from the analysis. These cases were deleted for different reasons. First, one case (case 95) was consistently found to be an outlier in five survey items and another case (case 74) in two survey items. A possible reason for this is that these subjects responded to present themselves in a favorable light to meet their tendency of social desirability. Support for this argument comes from a study conducted by Jan and Hall (2005), which demonstrated that social desirability affects goal orientations measures.

Another reason for eliminating the outliers from the analysis was to meet the statistical assumptions. For example, the normality assumption was not met when outliers were included in the analysis. Table 2 provides the descriptive statistics for the measured variables before and after the deletion of outliers.

**Normality**

After deleting the outliers, all measured variables were examined for skewness and kurtosis using George and Mallery’s (2006) guidelines. Results showed that the
skewness and kurtosis values for all measured variables were within the acceptable range of ±2.

**Multicollinearity**

Multicollinearity was examined by first checking the zero order correlation between predictors. A moderate correlation (r = .453) was found between self-efficacy and mastery goal. Other correlations among predictors were weak. The variance inflation factor (VIF) was another criteria examined to check the multicollinearity assumption. The VIF for a predictor indicates whether the predictor has a strong linear association with other predictors in the model. According to Stevens (2002), multicollinearity is a concern if the VIF exceeds 10. Inspection of the VIF for all predictors showed that the assumption of multicollinearity was met.

**Table 2:** *Mean and Standard Deviation of Observed Variables Before and After Deletion of Outliers.*

<table>
<thead>
<tr>
<th>Variables</th>
<th>Before Outliers</th>
<th>After Outliers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>Sd</td>
</tr>
<tr>
<td>Total Score</td>
<td>1062</td>
<td>85</td>
</tr>
<tr>
<td>Knowledge Monitoring</td>
<td>.55</td>
<td>.33</td>
</tr>
<tr>
<td>Self-Efficacy</td>
<td>21</td>
<td>2.7</td>
</tr>
<tr>
<td>Mastery Goal</td>
<td>23</td>
<td>2.1</td>
</tr>
<tr>
<td>Performance Goal</td>
<td>26</td>
<td>5.9</td>
</tr>
</tbody>
</table>
**Homoscedasticity**

As defined by Mertler and Vannatta (2005, p. 34), “Homoscedasticity is the assumption that the variability in scores for one continuous variable is roughly the same at all values of another continuous variable.” Bivariate scatter plots matrices were used to examine the assumption of homoscedasticity and the assumption was met.

**Principal Component Analysis**

Principal component analysis (PCA) was conducted utilizing a varimax rotation on the 19 items of self-efficacy and goal orientations to determine their underlying dimensions. Utilizing the Kaiser (1960) criterion of retaining components whose eigenvalues are greater than 1, four components were retained. The first factor was composed completely of items that measure performance-approach and performance-avoidant goals. Factor 2 was composed entirely of items that measure self-efficacy. Factor 3 was composed of four items that measure mastery goals. Factor 4 was a rather strange factor and it was composed of two items, items: 1 and 5. Item 5 measures mastery goals and item 1 measures performance avoidant goals. These two items (1 and 5) also had factor loadings on the performance goals factor and on mastery goals factor, respectively. Stevens (2002) stated that blind use of eigenvalues criterion could lead to retaining factors that might have no practical significance. Stevens also recommended not interpreting components with only a few low loadings unless the sample size is at least 300. In addition, the scree plot was also assessed and it indicated that the eigenvalues after the third component drop off drastically (see Figure 2). This method implied that only the three components should be retained. Thus, the principle
component analysis (PCA) was run again, this time eliminating the eigenvalue criteria and indicating that three factors should be retained. The PCA retained three components where item 1 loaded on performance goals factor and item 5 loaded on the mastery goals factor. After rotation, together the three components accounted for 57.82% of the total variance. The first component accounted for 26.06% of variance, the second component for 22.4%, and the third component for 9.35% (for component loadings see Appendix D). Component number 1 consisted of nine items. These items had positive loadings and addressed performance goals (performance-approach and performance avoidance.) Component number 2 consisted of five items. These items had positive loadings and addressed mastery goals. Component number 3 consisted of five items; they had positive loadings, which addressed self-efficacy. Having found that performance-approach goals items (2, 4, 6, 8, 12) and performance avoidant goals items (1, 10, 13, 17) loaded on one factor, the dichotomous model (mastery goals and performance goals) of achievement goals was the best model to represent the data. The PCA revealed a final model of three factors, which were self-efficacy, mastery goals, and performance goals. Three variables were developed by summing item responses in each dimension of the three factor model of self-efficacy and goal orientations.

The level of internal consistency was also examined using Cronbach’s alpha before and after the fixed extraction method was used. Table 3 presents the coefficient alpha (α) for the four factors. The factor number 4 has a negative coefficient which indicates that the items do not measure the same trait. Table 4 presents the coefficient alpha (α) for the three factors and shows that the reliability data still suggests high
consistency in students’ responses to the items when item 1 and item 5 (initially factor 4) were loaded into performance goals and mastery goals, respectively. In addition, odd-even split-half reliability estimation using the Pearson product-moment indicated that the measure of knowledge monitoring accuracy was of a sufficient reliability ($r = .52, p < .001$).

*Figure 2. Scree Plot*
Table 3: Reliabilities among the Four Factors.

<table>
<thead>
<tr>
<th>Factor</th>
<th>Items</th>
<th>Coefficient Alpha (α)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Performance Goal</td>
<td>2, 4, 6, 8, 10, 12, 13, 17</td>
<td>.885</td>
</tr>
<tr>
<td>Mastery Goal</td>
<td>3, 9, 15, 19</td>
<td>.762</td>
</tr>
<tr>
<td>Self-Efficacy</td>
<td>7, 11, 14, 16, 18</td>
<td>.859</td>
</tr>
<tr>
<td>Factor number four</td>
<td>1, 5</td>
<td>-.485</td>
</tr>
</tbody>
</table>

Note: See Appendix D for item statement.

Table 4: Reliabilities among the Three Factors.

<table>
<thead>
<tr>
<th>Factor</th>
<th>Items</th>
<th>Coefficient Alpha (α)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Performance Goal</td>
<td>1, 2, 4, 6, 8, 10, 12, 13, 17</td>
<td>.883</td>
</tr>
<tr>
<td>Mastery Goal</td>
<td>3, 5, 9, 15, 19</td>
<td>.753</td>
</tr>
<tr>
<td>Self-Efficacy</td>
<td>7, 11, 14, 16, 18</td>
<td>.859</td>
</tr>
</tbody>
</table>

Note: See Appendix D for item statement.

Research Question 1

RQ (1): What is the unique contribution of each of the predictor variables on the variability in the mean total exam score for undergraduate students enrolled in the Educational Psychology course at Kent State University?

Table 5 presents the correlations between all variables in the study. Relations between variables in the conceptual model were first examined with Pearson product-moment. The correlation analysis was completed in order to examine the relational patterns of the variables of interest. Knowledge monitoring, self-efficacy, and mastery goals factors significantly correlated with total score ($r = .289$, $r = .188$, $r = .233$, respectively). The performance goals factor did not significantly correlate with the total score. In addition, the self-efficacy factor significantly correlated with mastery goals
factor \( (r = .453) \). Knowledge monitoring did not significantly correlate with motivational variables in this study.

Table 5: *Correlations of Observed Variables.*

<table>
<thead>
<tr>
<th>Variables</th>
<th>1.</th>
<th>2.</th>
<th>3.</th>
<th>4.</th>
<th>5.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Total Score</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. K-M</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.289**</td>
</tr>
<tr>
<td>3. Self-Efficacy</td>
<td></td>
<td>.188*</td>
<td></td>
<td>.020</td>
<td></td>
</tr>
<tr>
<td>4. Mastery</td>
<td></td>
<td>.233**</td>
<td>-.101</td>
<td></td>
<td>.453**</td>
</tr>
<tr>
<td>5. Performance</td>
<td></td>
<td>.087</td>
<td>-.024</td>
<td>.078</td>
<td>.022</td>
</tr>
</tbody>
</table>

Note: 1K-M = knowledge monitoring. 2** = \( p < .01 \). 3* = \( p < .05 \).

Standard multiple regression was conducted to determine the accuracy of the independent variables (knowledge monitoring, self-efficacy factor, mastery goals factor, and performance goals factor), predicting students’ total score in the Educational Psychology course. Results from Table 6 indicated the \( t \) statistics for the regression coefficient of knowledge monitoring and mastery goals factors were statistically significant. Enter method was used to determine the unique contribution of the significant predictors. The results also indicated that after controlling for self-efficacy factor, mastery goals factor, and performance goals factor, the unique contribution of knowledge monitoring for the prediction of total score was statistically significant,
Moreover, the results showed that after controlling for knowledge monitoring, self-efficacy factor, and performance goals factor, mastery goals factor explained a unique proportion of variability on total score, $f(1, 125) = 6.804, p = .010$. In contrast, the $t$ statistics for the regression coefficients of self-efficacy and performance goals factors were not statistically significant. Thus, there was no unique contribution of either of these two factors for predicting the total score.

Table 6. Summary of Multiple Regression Analysis for Variables Predicting Total Score.

<table>
<thead>
<tr>
<th></th>
<th>$R^2$</th>
<th>$B$</th>
<th>$SE B$</th>
<th>$B$</th>
<th>$T$</th>
<th>$P$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.083</td>
<td>79.157</td>
<td>20.973</td>
<td>.310</td>
<td>3.775</td>
<td>.000</td>
</tr>
<tr>
<td>2</td>
<td>.035</td>
<td>2.010</td>
<td>2.889</td>
<td>.064</td>
<td>.696</td>
<td>.488</td>
</tr>
<tr>
<td>3</td>
<td>.054</td>
<td>11.349</td>
<td>4.351</td>
<td>.239</td>
<td>2.609</td>
<td>.010</td>
</tr>
<tr>
<td>4</td>
<td>.008</td>
<td>1.296</td>
<td>1.119</td>
<td>.095</td>
<td>1.158</td>
<td>.249</td>
</tr>
<tr>
<td>5</td>
<td>677.033</td>
<td>98.724</td>
<td>6.858</td>
<td>6.858</td>
<td>.000</td>
<td></td>
</tr>
</tbody>
</table>

Note: 1 = knowledge monitoring; 2 = self-efficacy; 3 = mastery goal; 4 = performance goal; and constant = 5. $N = 125$

**Research Questions 2, 3, and 4**

RQ (2): Is the effect of knowledge monitoring on the mean total exam score dependent on the self-efficacy and goal orientations of undergraduate students enrolled in the Educational Psychology course at Kent State University?

RQ (3): Is the hypothesized model that describes the causal effects among the variables “knowledge monitoring accuracy,” “self-efficacy,” “goal orientations,” and “students’ performance” consistent with the observed correlations among these variables?

RQ (4): If the model is consistent, what are the estimated direct, indirect, and total causal effects among the variables?
Path analysis was conducted to answer questions 2, 3, and 4. Amos 5 software (Arbuckle, 2003) was used employing maximum likelihood path analysis (Chou & Bentler, 1995). The estimated standardized path coefficients are presented in Figure 3. As expected, the knowledge monitoring and mastery goals factors significantly correlated with total score ($r = .289$, $r = .233$, respectively). Unexpectedly, self-efficacy and performance goals factors did not significantly correlate with the total score. However, the self-efficacy factor significantly correlated with mastery goals factor ($r = .453$). For ease of understanding, Figure 4 presents the path model with statistically significant parameters. Table 7 presents the direct, indirect, and total effects of all predictor variables on total score.

Two predictors had significant direct effects on total score, knowledge monitoring ($\beta = .308$) and mastery goals factor ($\beta = .231$). Self-efficacy factor had a significant direct effect on mastery goals factor ($\beta = .456$). Although self-efficacy factor significantly correlated with total score, the parameter between self-efficacy factor and total score was not significant ($\beta = .071$). The path analysis revealed no significant exogenous parameters from or to performance goals factor.
Figure 3. Path Model Tested with Standardized Path Coefficients.

Figure 4. Path Model with Significant Path Coefficients.
Table 7: Standardized Effects of Predictor Variables on Total Score.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Direct Effects</th>
<th>Indirect Effects</th>
<th>Total Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge Monitoring</td>
<td>.308</td>
<td>-.024</td>
<td>.283</td>
</tr>
<tr>
<td>Self-Efficacy</td>
<td>.071</td>
<td>.112</td>
<td>.183</td>
</tr>
<tr>
<td>Mastery Goal</td>
<td>.231</td>
<td>.000</td>
<td>.231</td>
</tr>
<tr>
<td>Performance Goal</td>
<td>.086</td>
<td>.000</td>
<td>.086</td>
</tr>
</tbody>
</table>
CHAPTER V
DISCUSSION

The aim of the present study was to investigate the relationship between knowledge monitoring, self-efficacy, and achievement goal orientations. The study also investigated the relationship between these predictors and academic achievement as reflected in examination grades. In addition, the study utilized the relationship between all measured variables to examine the proposed path model (Figure 1).

The study first examined the underlying dimensions of the 19 items that were adapted to measure self-efficacy and goal orientations. The findings from principal component analysis (PCA) in this study showed the prevalence of two types of achievement goal orientations for the participating undergraduate students in the Educational Psychology course at Kent State University: mastery and performance goal orientations. Therefore, from a theoretical point of view, these findings add support to the dichotomous framework of achievement goal motivation theory. In the dichotomous framework, achievement goal orientation is divided into two goals: mastery and performance goals.

One primary objective of this study was whether students’ scores on educational psychology course could be predicted by individual differences in knowledge monitoring, self-efficacy, and achievement goal orientations. The results of this study showed a positive relationship between knowledge monitoring and total score. That is, students who are more accurate at knowledge monitoring perform significantly better as
operationalized by the course total score. This finding parallels those of previous studies exploring students’ monitoring accuracy (Campione et al., 1989; Everson et al., 1994; Hartwig et al., 2011; Tobias et al., 1991). Furthermore, as discussed in the introduction, investigation of this relationship and including motivational predictors of the academic achievement into the model will have important implications for education and for theory of self-efficacy and goal orientations.

As predicted, the direct and indirect effects of knowledge monitoring demonstrated a relationship to academic achievement. The parameter between knowledge monitoring and total score of the Educational Psychology course was a positive parameter in the model. Regression analysis demonstrated that knowledge monitoring accounted for the most variance (8%) in the total score. This effect size is noteworthy when taking into consideration the different predictors that contribute to students’ exam performance. Students’ performance in the Educational Psychology course was significantly shaped by students’ knowledge monitoring accuracy. The interpretation for this relationship is that the ability to differentiate between the learned and unlearned materials is an essential ability in the learning process. Tobias and Everson (2009, 1996) argued that knowledge monitoring is a prerequisite metacognitive process and the effective control of a student’s learning cannot occur without accurate knowledge monitoring. In addition, an effective control of someone’s learning requires some activities, such as evaluating learning and selecting appropriate learning strategies (Al-Harthy et al., 2010; Bembenutty, 2007; Vrugt & Oort, 2008).
Although the current study provided evidence for a positive link between knowledge monitoring and students’ performance, knowledge monitoring did not significantly correlate with motivational predictors as defined by self-efficacy and goal orientations. The study hypothesized that self-efficacy and goal orientations would mediate the relationship between knowledge monitoring and total score. The relationship between self-efficacy, goal orientations and knowledge monitoring is largely unexplored. Goal orientations have been investigated as a predictor of students’ achievement, but there is some support for its role as a mediator of knowledge monitoring. For example, research on knowledge monitoring (Hartwig et al., 2009; Tobias & Everson, 2009, for reviews) has demonstrated that performance avoidant goals partially mediated the relationship between knowledge monitoring and exam performance.

Self-efficacy and mastery goals involve the use of cognitive strategies, such as personal judgments of capabilities, assessment of what is required (Bandura, 1993), and using learning strategies that promote comprehension (Al-Harthy et al., 2010; Elliot, 1999). That being demonstrated, one would undoubtedly obtain a more complete view of how high self-efficacy and mastery oriented students use these cognitive activities to control learning by engaging knowledge monitoring in the process of learning. For example, imagine two students studying the Arabic language. Both students are good knowledge monitors. One student studies Arabic because s/he plans to visit countries in which only Arabic is spoken and she believes that it is beneficial to speak the same language. In contrast, the second student does not like learning another language, but has to take the class to fulfill a requirement. In this example, high efficacy beliefs and
mastery orientation have provided a valuable advantage to the first student, regardless of knowledge monitoring ability. It has been demonstrated that the first student, in this case, because of her/his efficacy beliefs and mastery orientations, would use cognitive strategies to help achieve the goal (Al-Harthy et al., 2010; Bandura, 1993; Elliot, 1999), which the researcher assumed that would require using knowledge monitoring. The researcher asserts that the current study provides some insights in understanding the relationship between knowledge monitoring and motivational variables and highlights the promise of exploring these relationships in future research.

Admittedly, the focus of measuring motivational variables at the beginning of the course semester may weaken the design of the current study. The motivational effects are not derived from the goals and self-efficacy themselves, but rather from the fact that students evaluate themselves as part of their responses to their own behaviors. It is important to acknowledge that patterns of goals may change across time: that is, as the students move into different learning situations that reflect the nature of the class, their academic goals may reflect to some degree the actual goals for that particular class. If so, students who initially had relatively low or high efficacy beliefs and adapted a certain goal orientation at the beginning of the course semester may have changed later on throughout the semester. Thus, one avenue for future research pertains to a potential limitation of this study: given that motivational variables were measured at the beginning of the semester, it was unclear whether these motivational variables were pre-existed variables students brought to the class or were adapted for the Educational Psychology
class. Certainly, a first step for progress is merely demonstrating motivational measures at the beginning and at the end of the semester.

As predicted, zero order correlation between self-efficacy, mastery goal orientation, and students’ total score were significant. These results actually support predictions from self-efficacy and goal orientations theories. Students with high precepts of self-efficacy consequently persist longer, seek moderately challenging learning tasks, view failures as learning opportunities, and achieve more academic success (Al-Harthy et al., 2010; Bandura, 1986; Deemer, 2004). The social cognition model of motivation (Bandura, 1997) emphasized the role of perceptions of efficacy in determining individuals’ striving for achievement. Bandura proposed that self-efficacy beliefs are the major determinant of goal setting, activity choice, willingness to expand effort, and persistence. Students form beliefs about what they can do, and then guide their learning accordingly. Also, they are more likely to anticipate outcomes of prospective actions. However, the present study findings differed from those of previous research in terms of unique contribution that self-efficacy has on students’ achievement. In this study, the path model analysis revealed that the parameter between self-efficacy and total score was not a significant parameter in the model. The absence of a significant direct effect of self-efficacy factor on total score in the final model was most likely due to the distribution of shared variance with mastery goals factor.

Bandura (1993) argued that one way that self-efficacy contributes to students’ motivation is through goals. More specifically, self-efficacy beliefs determine the goals students set for themselves. The empirical support for this argument comes from a study
conducted by Al-Harthy et al. (2010), where determination of goals depended on students’ efficacy beliefs. Students with high self-efficacy adopted mastery goals for their learning, whereas those with low self-efficacy adapted performance avoidant goals. The interpretation that self-efficacy affects students’ total score by influencing the goals students adapt for their learning seems plausible and corresponds with previous research findings (e.g., Al-Harthy et al., 2010). The findings of the present study support the movement toward encouraging instructors to promote mastery goals in their teaching.

As hypothesized, the correlation between self-efficacy and mastery goals factors is a strong positive parameter in the model. The current study findings showed that students with high self-efficacy were mastery oriented and had high academic achievement. This finding is consistent with the findings from previous research studies investigating relationships between self-efficacy and mastery goal orientation (Al-Harthy et al., 2010; Anderman & Young, 1994; Meece et al., 1988; Middleton et al., 1998; Middleton & Midgley, 1997; Midgley & Urdan, 1995; Roeser et al., 1996; Skaalvik, 1997; Turner et al., 1998; Wolters et al., 1996). The interpretation of this result is that students with high self-efficacy beliefs have high confidence in their ability to successfully perform certain tasks and set mastery goals and were more likely to see the educational psychology experience as a challenge rather than a threat. According to the social cognitive theory, students with high self-efficacy tend to persist in the face of difficulty, seek moderately challenging learning tasks, and view failures as learning opportunities (Bandura, 1986). All these aspects are theoretically consistent with the mastery goal orientation characteristics. Students set personal expectations for their
learning in accordance with their academic self-efficacy. Al-Harthuty et al. (2010) argued that these expectations directly and indirectly affect students’ goals by directing students to pursue specific goal orientation.

Another predicted parameter in the model was between mastery goals factor and total score. The interpretation of this result is that the mastery goals orient students toward a learning approach characterized by satisfaction upon mastery or completion of a task, with greater levels of efficacy, task value, metacognitive self-regulation (Al-Harthuty et al., 2010), and greater use of cognitive and metacognitive strategies (Pintrich, 2000). In addition, mastery oriented students invest considerable efforts in tasks and use learning strategies that promote comprehension of course material. Most important, mastery oriented students perform self-learning evaluation and persist in the face of failure (Elliot, 1999).

Surprisingly, the results of path analysis (Figure 3) revealed no significant exogenous parameters to or from performance goals factor in the model. This finding is in line with and can be explained through a limited amount of research. Literature regarding goal orientations describes performance oriented students as displaying ability or looking good when compared to their classmates (Elliot, 1999; Nicholls, 1984; Somuncuoglo & Yildirim, 1999). In contrast, when students are allowed to describe their goals using their own words, they rarely mention performance goals. They may aspire to pass a class or get a higher grade, but they seldom talked about friends (Urdan, 2001; Urdan, Kneisel, & Mason, 1999). Brophy (2005) made another argument about self-reports measures of performance goals in the academic context. Brophy argued
against the causal link between performance goals adoption and subsequent performance because of the effects that students’ history of past achievement has on students when completing performance goals measure. These effects are perhaps reflected in the relationship between performance goals measure and measure of students’ achievement. This argument adds more support to the suggestion made earlier in this discussion in that future research should consider applying goal orientations measures at different times during the academic semester in which the researcher conducting research.

In addition, social desirability is defined as students’ tendency to present themselves in a favorable light and found to be a source of method bias in self-report questionnaire research. Jan and Hall (2005) demonstrated that social desirability affects goal orientations measure. They examined the social desirability effects on goals measures and found positive loadings for performance-approach goals on the social desirability construct. Another issue concerning the performance goals is when students define a specific adopted goal but eventually judge success relative to criteria that does not match the goals. For example, a student may set a goal of demonstrating competence but use personal improvement as a measure to ward the goal. It seems reasonable to conclude that, under natural classroom conditions, performance goals are a low-incidence phenomenon; however, more research may need to be conducted to further examine the performance goals and its relationship with different classroom practices, such as teaching methods and assessment practices.
Conclusion

Students’ academic achievement as a research topic has received a great deal of attention. This research has investigated different variables that contribute to the variability of students’ achievement (e.g., Al-Harthy et al., 2010; Hartwig et al., 2011; Isaacson & Was, 2010). Despite decades of research on metacognition and motivation, few empirical research attempts have been made to link components of metacognition to motivation defined in self-efficacy and goal orientations. This study not only attempted to create this link by investigating the possible relationship between knowledge monitoring, self-efficacy and goal orientations, but also to explore how this relationship might add to our understanding of the variability in students’ achievement. Based upon the findings of this study, a number of recommendations for future research are suggested.

First, the results of this study support the conclusion about the robust positive relationship between knowledge monitoring and students’ achievement. Therefore, the nature of this predictor in classroom settings needs to be considered in future research. For instance, future research might focus on investigating different classroom practices that might assist students become accurate knowledge monitors. We should move on to concentrate on the practical and useful employment of knowledge monitoring to enhance teaching and facilitate students’ learning.

Second, the current study did not provide evidence for the positive link between knowledge monitoring and motivation (as defined by self-efficacy and goal orientations.) However, the argument was that despite self-efficacy and goal orientations theories differ
from metacognition construct in their conceptualization and measurement, they nevertheless involve the use of cognitive activities. The research discussed above demonstrated that self-efficacy and goal orientations involve some cognitive activities, such as forming expectations and evaluating the learning process. This study continued the argument by testing the assumption that because of these cognitive activities, knowledge monitoring should in some way correlate to motivational variables. It might be a systematic bias that has affected the existence of this relationship. More specifically, the measurement of self-efficacy and goal orientations in this study took place at the beginning of the Educational Psychology course. The underlying dimensions of goal orientations may not be the same after students spend more time in the course and become more familiar with the course nature. Put differently, what subjects report regarding their goal orientations may not be the same as the perceptions and beliefs they have at the time they are actually engaging in different tasks. Thus, future research may need to examine the students’ goal orientations at different times or stages of the semester. Greater accuracy might have been obtained if students were given the opportunity to express their goals and efficacy beliefs at different times in the semester; therefore, classroom observations and interviews could be critical in understanding what efficacy beliefs and goals students adopt for their learning.

Moreover, the present findings are consistent with goal orientations literature in that mastery goal orientation is a positive predictor of the students’ achievement as defined by total score. The future research should move on to investigate which aspects of the classrooms practices may have effects on students goal orientations. Future
research may need to independently consider each aspect of learning environment, such as class activities, and how could affect students goals.

A surprising finding of the current study was the absence of the performance goals factor from the path model. One possible explanation discussed above is the limitation of self-report measure used in this study. Another possible explanation might be that performance goals are not good goals to adapt for this particular class. This could be because of the teaching and assessment practices used in this class. Thus, fertile ground for research might improve the design of the current study by sampling additional classrooms, domains, and students.

In short, the present study is important because it started the argument, in view than has been the case to date, about the potential relationship between knowledge monitoring, self-efficacy, and goal orientations. Future research should address the ways in which these predictors interact with each other to influence students’ academic performance and achievement. This study, for example, suggests that there is a need for an examination of how different components of metacognition, such as knowledge monitoring correlates with motivational variables, specifically, self-efficacy and goal orientations. Clearly, this relationship is more complex than initially anticipated, and a full understanding of this important relationship awaits experimental and field research attending to various features of classroom achievement situations. For instance, a future experimental study might assign subjects who are accurate and inaccurate knowledge monitors to different groups and manipulate self-efficacy and each of goal orientations to
each group. Using such an experimental design would explain more of this complex relationship and would detect any mediation that might exist.

In addition, the research completed thus far has tested the predictive power of knowledge monitoring, self-efficacy, and mastery goals for students’ performance. Future research needs to move on to explore the nature of each predictor in real-life classroom settings. One study might focus on how each of these predictors operates in achievement situations and whether they change as students further engage in different demanded academic tasks. Another line of research might investigate the relationship of each of these predictors with classroom teaching practices, such as classroom assessments and activities. Of course, these recommended studies will gain more importance when it is grounded in the reported perceptions and related observations of students. Such research may strengthen the case for greater awareness among educators as how each of these predictors operates in real-life classroom and how metacognition and motivation tendencies manifest in the classroom.
APPENDICES
APPENDIX A

ACHIEVEMENT GOAL ORIENTATIONS SCALE
Appendix A

Achievement Goal Orientations Scale

**Mastery Goal Orientation**

It’s important to me that I learn a lot of new concepts in this class. (Revised)

One of my goals in class is to learn as much as I can.

One of my goals is to master a lot of new skills in this class. (Revised)

It’s impotent to me that I thoroughly understand my class work.

It’s important to me that I improve my skills in this class. (Revised)

**Performance-Approach Goal Orientation**

It’s important to me that other students in my class think I am good at my class work.

One of my goals is to show others that I’m good at my class work.

One of my goals is to show others that class work is easy for me.

One of my goals is to look smart in comparison to the other students in my class.

It’s important to me that I look smart compared to others in my class.

**Performance-Avoidance Goal Orientation**

It’s important to me that I don’t look stupid in class.

One of my goals is to keep others from thinking I’m not smart in class.

It’s important to me that my teacher doesn’t think that I know less than others in class.

One of my goals in class is to avoid looking like I have trouble doing the work.
APPENDIX B

SELF-EFFICACY SCALE
Appendix B

Self-Efficacy Scale

I’m certain I can master the skills taught in class. (Revised)

I’m certain I can figure out how to do the most difficult class work.

I can do almost all the work in class if I don’t give up.

Even if the work is hard, I can learn it.

I can do even the hardest work in this class if I try.
APPENDIX C

KNOWLEDGE MONITORING ASSESSMENT
### Appendix C

#### Knowledge Monitoring Assessment

<table>
<thead>
<tr>
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APPENDIX D

COMPONENT LOADING
### Component Loading

**Component 1: Performance Goals**

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<td>It’s important to me that my teacher doesn’t think that I know less than others in class</td>
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**Component 2: Mastery Goal**

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<td>It’s important to me that I thoroughly understand my class work</td>
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<td>It’s important to me that I improve my skills in this class</td>
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**Component 3: Self-Efficacy**

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REFERENCES
REFERENCES


