STUDENTS' PRIOR KNOWLEDGE, ABILITY, MOTIVATION, TEST ANXIETY, AND COURSE ENGAGEMENT AS PREDICTORS OF LEARNING IN COMMUNITY COLLEGE PSYCHOLOGY COURSES

By

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To Tammy

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Many researchers and educators are interested in students' cognitive, motivational, test anxiety, and behavioral characteristics that relate to learning. The purpose of this study was to test a social cognitive model of student learning in psychology courses. Specifically, the model was designed to determine whether students' prior knowledge, ability (reading comprehension and prior grade point average), motivation (entity beliefs, achievement goal orientation, interest, and self-efficacy beliefs), test anxiety, and course engagement (learning strategies, homework, class participation, and quizzes) predict their achievement on exams in community college psychology courses.

Participants were 210 undergraduate students enrolled in psychology courses at a southeastern community college. The results of the study showed that prior knowledge, reading ability, elaborative study strategies, and quizzes had direct positive effects on exam performance, whereas test anxiety had a direct negative effect on exam performance. In addition, prior grade point average, perceived self-efficacy, attendance, homework, and class participation had indirect positive effects on exam performance, whereas performance-avoidance goals had an indirect negative effect on exam performance. In addition, interest had a direct positive effect on

mastery goals and elaborative cognitive processing. Consistent with prior research, self-efficacy beliefs predicted achievement goal orientations and cognitive strategies. Although prior grade point average did not directly predict exam performance, prior grade point average had a direct positive effect on attendance, homework, and class participation. Attendance had a direct positive effect on class participation, homework, and quizzes. Performance-avoidance goals had a direct positive effect on test anxiety and surface processing strategies. Last, class participation predicted homework scores, and homework scores predicted quiz scores. The findings from this study provide groundwork for future experimental research and implications for educational practice.

CHAPTER 1
INTRODUCTION

Individual Differences and Learning

Significant economic, technological, and social changes have affected higher education (Dennis, 2004). With more people gaining access to higher education than ever before, researchers have begun to examine the factors that engage adult students and influence learning (Dennis, 2004). Researchers have examined teacher, student, content, and contextual variables that relate to learning and have found factors that relate to student learning in higher education (for a review, see Menges & Austin, 2001). Student individual difference variables that relate to learning include level of interest, perceived self-efficacy, motivation, cognitive strategies, test anxiety, and engagement.

Researchers have used many different statistical methods to examine the relationships between students' characteristics and learning in educational settings. Researchers utilizing structural equation modeling have been able to elaborate on and refine correlational-regression models (Fenollar, Roman, & Cuestas, 2007; Hulleman, Durik, Schweigert, & Harackiewicz, 2008; Harackiewicz, Barron, Tauer, & Elliot, 2002; Seifert & O'Keefe, 2001). However, most of the researchers examining these relationships have focused on learners in primary and secondary school settings (e.g., Simons, Dewitte, & Lens, 2004). Researchers have shown that students' characteristics that relate to learning in children differ from those that relate to learning in adults (Valle et al., 2003; Vermetten, Vermut, & Lodewijks, 1999). For instance, adults use deeper levels of processing and different motivational strategies while learning when compared to children (Vermetten et al., 1999). Additional studies are needed that examine the relationships between students' characteristics and learning in adult populations.

Even when researchers have examined the factors that relate to learning in adult populations they have disagreed over whether factors that relate to learning in one subject relate similarly to learning in other academic disciplines. Some researchers have examined how students' characteristics relate to learning across disciplines in higher education (see McKenzie, Gow, & Schweitzer, 2004), and other researchers have suggested that factors related to learning may be discipline specific (see Donald, 1995). Factors that relate to student success in psychology courses, for example, may differ from factors that relate to success in organic chemistry classes. Research with path modeling would be useful in identifying individual differences that relate to learning within discipline-specific contexts because the importance of student characteristics most likely differs by discipline (Zeegers, 2004). Once research in many specific disciplines is conducted, researchers will be able to make comparisons between the findings to determine if characteristics that relate to learning differ by disciplines. Only a few researchers have used structural equation modeling to study the complex relationships between students' characteristics that influence learning in higher education settings (e.g., Fenollar et al., 2007; Hoffman & Van den Berg, 2000; Lietz, 1996; Murray-Harvey, 1993), and even fewer such studies have examined these relationships in college psychology courses. Busato, Prins, Elshout, and Hamaker (2000) used structural equation modeling to examine how individual differences relate to learning in college psychology classes but cited problems in correlational patterns that prevented analysis of the data. To answer the important question of whether student characteristics relate to learning across disciplines or are discipline specific in higher education, researchers need to study these relationships within specific disciplines.

Much of the research on student characteristics related to learning in psychology courses in higher education has been conducted at 4-year institutions. Factors related to learning in

foundational community college courses may differ from success factors for upper-level university courses. For instance, community college professors may focus more on content in foundational courses, and professors teaching upper division courses may focus more on critical analysis of theories or the creation of new knowledge. Therefore, student characteristics that relate to learning in community college psychology courses may not relate to learning in higher-level university psychology courses. In addition, students who choose to attend community colleges tend to differ from students who enroll in universities in terms of academic preparedness, educational goals, age, and socioeconomic status (Grimes & David, 1999). Therefore, characteristics that relate to learning for community college populations may not relate to learning in university populations. Research examining the relationship between student characteristics and learning in community college populations would allow researchers to compare the findings with the results of studies conducted in university settings.

In addition to extending existing theory, identifying students' characteristics that relate to learning within discipline-specific contexts should help educators improve educational practice. For instance, identifying student characteristics that relate to learning in psychology courses at community colleges as opposed to those offered at universities may help instructors of these courses predict which students might be at risk of failing. The results of such research may reveal that some characteristics have a greater impact on student learning than others. Identifying ways to positively affect learning should be a main goal of educators. The purpose of this study is to investigate whether students' prior knowledge, ability, motivation, test anxiety, and class engagement predict achievement on exams in community college psychology courses.

Theoretical Rationale of the Study

Learning involves changes in behavioral, cognitive, and emotional patterns as a result of experience (see Atkinson & Shiffrin, 1968; Broadbent, 1958; Mowrer & Klein, 2001; Piaget,

1963; Pintrich, Marx, & Boyle, 1993). Many educational psychologists are interested in the characteristcs that influence learning in educational settings and utilize a variety of theoretical frameworks to design research. Social cognitive researchers, for instance, have identified a variety of motivational constructs with implications for educational practice. For example, perceptions of self-efficacy and achievement goal orientation are often related to cognitive processing (see Elliot, McGregor, & Gable, 1999). Cognitive processes like self-regulation and learning strategies then, in turn, are related to behavioral performance on assessments (Alexander, Schulze, & Kulikowich, 1994; Elliot & McGregor, 2001; Elliot et al., 1999; Pintrich & De Groot, 1990). Using a social cognitive framework, I examined how students' characteristics relate to learning in community college psychology courses.

Social cognitive theorists provide a broader framework for understanding learning than behavioral or cognitive theories alone. Behaviorists defined learning as relatively permanent changes in behavior as a result of experience (Mowrer & Klein, 2001). Restricting the study of learning to behaviors limited the range of experiences behaviorists were able to explain. For example, behaviorists could explain behavioral changes that resulted from classical or operant conditioning; however, they failed to acknowledge cognitive changes that may not be expressed through behavioral performance. Cognitive theorists expanded the study of learning to include changes in cognitive structures and processes that result from experience. Cognitive theorists began to explain learning in terms of schematic adaptation (Piaget, 1963) and changes in memory systems (Atkinson & Shiffrin, 1968; Broadbent, 1958). Although cognitive models of memory extended the study of learning to include cognitive processes and abilities, many researchers found that affective and motivational constructs that relate to learning were neglected by both behavioral and cognitive theories (e.g., Pintrich et al., 1993). Social cognitive theorists

integrated affective, cognitive, behavioral, and environmental characteristics into theories that can more holistically represent human functioning, including learning (e.g., Zimmerman, 1989).

Social cognitive theorists provide a framework for understanding learning in the context of personal characteristics (cognition, affect, and biological factors), behavior, and environmental influences (Bandura, 1986). Essentially, Bandura presented the idea that each component (person, behavior, and environment) is both an influential force on and a function of the other two forces. Bandura called the dynamic interplay between the person, behavior, and the environment *reciprocal determinism*. Using the social cognitive framework, educational psychologists interested in learning that occurs in school settings may more completely represent the learning process as a dynamic interaction between the person (e.g., his or her beliefs, motivation, cognitive abilities), the person's behaviors (e.g., test performance, class participation), and the environment (e.g., classroom structure, teacher characteristics). Instead of seeing people as primarily reactive or passive, social cognitive theorists present a view of humans as using uniquely human capabilities to actively evaluate and direct their learning experiences.

Researchers measure learning in educational settings in a variety of ways. For instance, teachers may assess student learning using exams (e.g., recognition- or recall-based measurements), portfolios, presentations, or group projects. Once students understand how learning will be assessed in a course (an environmental factor), students' goals and self-efficacy beliefs will play a role in the selection of cognitive strategies they use to regulate their learning in preparation for the assessment. In this study, I used a social cognitive framework to examine the relationships among students' prior knowledge, ability, motivation, test anxiety, course

engagement, and academic achievement. In the following chapter, I explain how I investigated these relationships in community college psychology courses.

CHAPTER 2
LITERATURE REVIEW

Individual differences in learning, according to social cognitive theory, relate to a variety of personal, behavioral, and environmental influences. Individual differences among students exist in interest and background knowledge in the subject, reading ability, motivation, and academic ability. These individual differences relate to students' choices of cognitive strategies for learning which, in turn, affect academic achievement (see Elliot et al., 1999).

Fenollar et al. (2007) tested a conceptual model involving perceived self-efficacy, achievement goals, cognitive strategy, and effort as predictors of academic performance (see Figure 2-1). Essentially, Fenollar and associates found support for their model in which self-efficacy beliefs indirectly influenced academic performance through their direct effects on achievement goals, study strategies, and effort. Also, achievement goals indirectly affected academic achievement through the direct effects on study strategies and effort. Last, deep processing study strategies and effort had direct positive effects on academic performance.

Although the Fenollar et al. (2007) model provided insight into variables that may predict academic achievement, additional individual differences that predict academic performance in college populations may have been left out of their model. The addition of other student characteristics such as prior knowledge, ability, test anxiety, and performance on course work to the Fenollar et al. (2007) model may provide additional insight into the strength of the reported relationships when other variables are included. In this chapter, I review prior research with the purpose of constructing a structural equation model of individual difference variables influencing college students' learning.

Prior Knowledge and Ability

Individual differences in background knowledge and ability predict academic achievement. Students differ in their prior exposure to course material, their overall college grade point averages (GPA), and their ability to read and comprehend text. Researchers have found that those students with prior knowledge of a subject tend to perform better than those with no previous exposure to the subject (see Alexander et al., 1994; Hudson & Rottmann, 1981). Researchers have also reported that overall college GPA predicts exam performance in introductory psychology college courses (Hardy, Zamboanga, Thompson, & Reay, 2003). Last, several studies have shown that the ability to read and comprehend text relates to achievement in college psychology courses (see Fields & Cosgrove, 2000; Gerow & Murphy, 1980; Jackson, 2005; Kessler & Pezzetti, 1990; Roberts, Suderman, Suderman, & Semb, 1990). In the next sections, research in the areas of prior knowledge, GPA, and reading comprehension is reviewed as it relates to this study.

Prior Knowledge

Baddeley and Hitch (1974) and Cowan (1998) constructed information processing models that account for how background knowledge can affect learning. According to these models, the central executive searches previously stored knowledge and activates relevant information when one learns new information. Prior knowledge in a specific domain may either facilitate or interfere with learning. If learners have mastered knowledge in an area, then that knowledge is likely to facilitate additional learning. Learners with accurate background knowledge should process new information more efficiently and integrate new knowledge more effectively than students with inaccurate or no background knowledge. Accurate prior learning provides a scaffold for interpreting new information and allows students to incorporate new information into their cognitive frameworks. Research findings lend support to this theory. For example,

Moos and Acevedo (2008) reported that students with accurate prior knowledge tend to regulate their learning by planning, monitoring, and strategizing better than those with little or no prior knowledge.

Researchers have shown that students with prior knowledge of the subject matter of the course in a variety of academic disciplines (see Alexander et al., 1994; Greene, Costa, Robertson, Pan, & Deekens, 2010; Hailikari, Nevgi, & Komulainen, 2008; Hudson & Rottmann, 1981), including psychology (Thompson & Zamboanga, 2003, 2004), score higher on achievement tests in the discipline than students without such prior knowledge. Using regression analysis in a study of 209 college students, Alexander et al. (1994) found that prior knowledge of physics predicted achievement on a recall assessment. Greene et al. (2010) reported that participants with prior knowledge about the human circulatory system scored higher on an assessment after instruction than those with less prior knowledge. Hailikari et al. (2008) reported that prior knowledge in mathematics was the strongest predictor of achievement in math classes when controlling for academic self-beliefs and prior academic success. These studies typify a robust body of research that prior knowledge facilitates learning.

In accordance with findings in other academic disciplines, researchers have also reported that accurate knowledge of psychology predicts achievement in psychology courses. Using regression analysis in a study of 353 undergraduate students, Thomson and Zamboanga (2004) found that prior knowledge of psychology as measured on a pretest at the beginning of the semester predicted exam scores in introductory psychology with ability, as measured by ACT scores and participation in course activities, controlled. Thus, prior knowledge of the subject matter should aid in encoding, storage, and later retrieval of information when completing course assignments and taking exams. On the basis of these findings, I hypothesized that prior

knowledge would be positively related to performance on homework, course activities, quizzes, and exams.

College Grade Point Average

In addition to prior knowledge, performance in previous college courses has predicted future course performance in numerous studies. In particular, researchers have found that cumulative college GPA predicts success in future college courses (DeBerard, Spielmans, & Julka, 2004; Pursell, 2007; Zeegers, 2004). Zeegers reported that prior GPA was the strongest predictor of annual GPA in a group of 113 third-year college students in a structural model that included entrance exam scores, study strategies, self-regulation, and perceived self-efficacy. Pursell (2007) found that cumulative college GPA was a stronger predictor of success in organic chemistry classes than GPA in prerequisite chemistry courses alone. Thus, research supports the claim that prior academic performance predicts future performance on both global and specific measures of academic achievement.

Cumulative college GPA has also been shown to predict performance on exams in college psychology courses specifically (Hardy et al., 2003). Hardy et al. examined the relationship of background variables (prior GPA, aptitude test scores, and prior psychology coursework) as predictors of exam performance in an introductory psychology course. The authors predicted that the effect of background variables on achievement would be mediated by course involvement (attendance and participation). Only the background variables significantly predicted exam performance, with prior GPA being the strongest predictor of exam performance. The course involvement variables did not predict exam performance. In accordance with these findings, I expect that students with higher cumulative college GPAs will perform better on homework, course participation, quizzes, and exams than those with lower college GPAs.

Reading Comprehension

Most people view literacy as an important component of learning in higher education. Students vary in their abilities to decode and construct meaning from text. Certainly, students must rely on reading comprehension skills in some courses more than others. For instance, reading comprehension relates more strongly to achievement in courses that require more self-study (i.e., online courses) than in more traditional lecture-based courses (Roberts, et al., 1990).

Several studies have shown that the ability to read and comprehend text relates to achievement in college psychology courses (see Fields & Cosgrove, 2000; Gerow & Murphy, 1980; Jackson, 2005; Kessler & Pezzetti, 1990; Roberts et al., 1990). Kessler and Pezzetti found that students with higher reading ability persisted through the end of the course and scored between 7% and 12% higher on exams than those with lower ability as measured on the Nelson-Denny Reading Test (Brown, Fishco, & Hanna, 1993). In addition to the Nelson-Denny Reading Test, researchers have used student reading scores from college entrance exams as measures of reading ability (Fields & Cosgrove, 2000). Fields and Cosgrove (2000) found that when initial reading placement test scores were used to estimate reading ability, those students who scored at or above college level in reading received significantly higher grades in an introductory psychology course than students who scored below college level in reading.

Overall, researchers have reported mixed findings regarding the relationship between reading comprehension and achievement in psychology courses. Although some researchers have reported that reading comprehension is a strong predictor of achievement in psychology courses (e.g., Roberts et al., 1990), other researchers have reported only minimal effects of reading ability on achievement (Jackson, 2005). These differences in findings are most likely the result of differing measures of reading comprehension and different operational definitions of achievement. In addition, reading comprehension may predict achievement in some courses

more than others due to the amount of reading required. In this study, I expected that students' reading ability as measured on initial college placement exams predicts their scores on homework, course participation, quizzes, and exams.

Motivation

In addition to prior knowledge and ability factors, researchers have shown that motivation relates to academic achievement (see Busato et al., 2000; Elliot, 1999). Motivation is the process by which activities are started, directed, and maintained toward physical and psychological goals (Petri, 1996). In educational settings, many goals exist that may motivate students to learn. For instance, some students may be motivated to learn material to demonstrate their mastery of the material, whereas others may be motivated to learn material to demonstrate their competence related to others (Elliot, 1997). Much of the research on motivation in educational settings involves implicit theories of intelligence (Dweck, 1986), achievement goal orientation (Elliot, 1997, 1999), the level of interest a student has in specific academic disciplines (Middleton & Midgley, 1997; Skaalvik, 1997), and measures of perceived self-efficacy (Malka & Covington, 2005; Zimmerman & Kitsantas, 2005). Research on these motivational variables is relevant to this study and reviewed in the following sections.

Implicit Theories of Intelligence

Dweck (1986) proposed that individuals differ in the extent to which they believe intelligence is fixed or malleable. She referred to the belief that intelligence is fixed as an *entity theory* of intelligence and the belief that it is malleable as an *incremental theory* of intelligence. She theorized that implicit theories of intelligence predict the achievement goals students adopt. In her research, Dweck (2000) has shown that people with incremental theories of intelligence are more likely to adopt achievement goals that focus on mastery, persist in the face of challenging material, and view performance as reflective of effort. In contrast, those with entity

theories of intelligence are more likely to adopt achievement goals that focus on performance compared to others, demonstrate learned helplessness when facing challenging material, and view performance as reflective of innate ability.

Findings from several studies support the hypothesis that intelligence beliefs are predictive of achievement (see Dweck, 1996; Kasimatas, Miller, & Marcussen, 1996 for a review). However, inconsistencies exist in the research findings regarding intelligence beliefs and achievement goals. In a regression analysis involving data collected from 180 undergraduate psychology students, Elliot and McGregor (2001) reported that mastery avoidance goals were positively related to entity beliefs and negatively associated with incremental beliefs. In contrast, however, Cury, Elliot, Da Fonseca, and Moller (2006) found that incremental beliefs correlated positively with mastery goal orientations and entity beliefs correlated positively with performance-approach and performance-avoidance goal orientations. While some researchers reported relationships consistent with Dweck's theories, other researchers have failed to find relationships between intelligence beliefs and achievement goals (e.g., Dupeyrat & Mariné, 2005). Dupeyrat and Mariné reported that intelligence beliefs did not predict performance goals and found that entity beliefs had a negative effect on mastery goal orientation. Dupeyrat and Mariné reported that their findings may have differed from previous findings due to the uniqueness of their sample of adult students enrolled in a high school equivalency program. In congruence with Dweck's theory and previous findings (Cury, et al., 2006; Kasimatas, et al., 1996), I hypothesized that students' implicit beliefs about intelligence predict their achievement goals. Specifically, entity beliefs about intelligence are positively related to performance-approach and performance-avoidance goals, and incremental beliefs about intelligence are positively related to mastery goals.

Achievement Goal Orientation

Dweck (1986) proposed a social cognitive model of achievement goal orientation that includes mastery and performance goals that affect students' affect, cognition, and behavior in educational settings. Elliot (1997) more recently extended achievement goal theory to include a trichotomous framework: mastery, performance-approach, and performance-avoidance goal orientations. Essentially the theory purports that students who adopt different achievement goals approach learning differently. Those who adopt mastery goals tend to be concerned with developing task mastery and competence. Those who adopt performance-approach goals tend to be concerned with demonstrating competence relative to others, and those who adopt performance-avoidance goals focus on avoiding the appearance of incompetence relative to others.

Elliot et al. (1999) found that achievement goal orientation was linked to cognitive strategy use, with those adopting mastery goals more likely to use deeper processing strategies (e.g., elaboration) than those who adopted performance-oriented goals. More surface approaches to learning were preferred by those adopting performance-avoidance goals. The authors reported that performance-approach goals were positively related to exam performance, whereas performance-avoidance goals were negatively related to exam performance. The authors found that mastery orientation was unrelated to exam performance.

Some research has shown a link between achievement motivation and exam performance in college psychology courses (Busato et al., 2000; Darnon, Butera, Mugny, Quiamzade, & Hulleman, 2009; Jagacinski, Kumar, Boe, Lam, & Miller, 2010). In a study of 409 first-year psychology students, Busato et al. reported that achievement motivation was positively related to performance on the first psychology exam (r = .14). Jagacinski et al. (2010) reported that in their study of 162 introductory psychology students that mastery goals successfully predicted

achievement on the final exam score at the beginning (r = .24) and end (r = .25) of the semester. In the same study, performance-approach goals measured at the beginning of the semester did not predict final exam scores but predicted final exam scores when measured at the end of the term (r = .26). Performance-avoidance goals did not predict final exam scores at either point in the semester.

More recently, Fenollar et al. (2007) found that achievement goals did not directly affect academic performance but rather mediated the effect on performance through choice of cognitive strategies and effort expended on course assignments. Fenollar et al. also found that mastery goals had an indirect and positive effect on academic performance through deep processing strategies and self-reported effort spent on course assignments. Performance-approach goals had a direct effect on surface processing, but an indirect effect on academic performance through effort. Performance-avoidance goals had no direct effect on deep or surface processing strategies but did have indirect effects on academic performance through effort.

In light of these findings, I expected to find that students' mastery goals have an indirect and positive effect on exam performance through deep processing and performance on course assignments. I also expected to find that performance-approach goals are positively related to superficial processing strategies and have an indirect positive effect on exam performance through performance on course assignments. I expected to find that performance-avoidance goals have an indirect negative effect on exam performance through performance on course assignments.

In addition to the relationships between achievement goal theory and cognitive strategies, some researchers have reported mixed results concerning the link between achievement goal orientations and test anxiety (Middleton & Midgley, 1997; Pekrun, Elliot, and Maier, 2006;

Putwain, Woods, & Symes, 2010; Skaalvik, 1997; Sideridis, 2005; Tanaka, Takehara, & Yamauchi, 2006). Middleton and Midgley reported that mastery goals were unrelated to test anxiety in a study of sixth-grade students, whereas Skaalvik found that mastery goals were modestly negatively related to test anxiety in two samples of sixth- and eighth-grade students (*r* = -.23 and -.16). Middleton and Midgley found that performance-approach goals were moderately positively associated with test anxiety (*r* = .32), whereas Skaalvik found performance-approach goals to be slightly negatively related to test anxiety in one sample (r -.15) but unrelated in the second sample. More recently, researchers have reported weak or non-significant relationships between performance-approach goals and test anxiety (Putwain et al., (2010); Sideridis, 2005). Performance-avoidance goals have been consistently positively related to test anxiety (Middleton & Midgley, 1997; Skaalvik, 1997). Middleton and Midgley reported a correlation of .41, and Skaalvik reported correlations of .25 and .35. Although the differences are small, the stronger relationships reported by Middleton and Midgley might be due to their use of domain-specific measures of achievement goals in contrast to the general measures used by Skaalvik. In this study, I used domain-specific measures of achievement goals, and consistent with the results of Middleton and Midgley, I hypothesized positive associations between the performance goals and test anxiety.

Interest

Researchers focusing on interest and academic achievement have provided insight into the role interest plays in student motivation for learning. In describing his person-object theory of interest, Krapp (2005) defined interest as referring to "focused attention and/or engagement with the affordances of a particular content" (p. 382). Krapp further explained that interest consists of feeling-related (e.g., positive affect) and value-related (e.g., personal significance) valences. Related to Krapp's conception of interest as a value-related construct, other researchers have

described interest as *task value* (see Pintrich, Smith, Garcia, & McKeachie 1991). High levels of interest in a discipline should relate to the formation of achievement goal orientations. For instance, those who report an interest in a subject and see the knowledge as personally relevant and useful should be more likely to develop mastery goal orientations than those who do not express an interest in the subject. In fact, Hulleman et al. (2008) found that interest was positively related to mastery goal orientation (r = .62).

Researchers have reported the predictive value of student interest on exam performance (Hidi & Renniger, 2006; Hulleman et al., 2008; Shen, Chen, & Guan, 2007; Sorić & Palekčić, 2009). In a regression analysis of data from 202 sixth graders, Shen et al. (2007) reported that interest predicted physical education skill gain and scores on physical education exams. In addition to a direct effect of interest on achievement, Hidi (2006) suggested that the effect of interest on exam performance may be mediated by self-regulatory processes such as perceived self-efficacy and achievement goals. Sorić and Palekčić (2009) reported that interest had a direct positive effect on exam performance and an indirect effect on exam performance through learning strategies. Specifically, Sorić and Palekčić found that interest predicted elaborative (r = .22) and rehearsal (r = -.15) learning strategies. They found that the relationship between interest and exam performance was not significant when they controlled for learning strategies suggesting that learning strategies mediated the relationship between interest and achievement.

Interest also predicts achievement in psychology courses. Hulleman et al. (2008) conducted a study using 663 introductory psychology students. The researchers used regression analysis to examine interest in psychology at the beginning of the course as a predictor of achievement goals, future interest levels, and final course grades. Initial interest predicted mastery (β = .61) and performance-approach goals (β = .11). Initial interest levels also predicted

subsequent interest levels measured at the end of the course (β = .46). Lastly, initial interest did not predict final course grades directly, but did indirectly predict final course grade through utility value (how personally relevant students perceived the material to be). Additional studies examining the relationship of interest to achievement are needed.

In addition to predicting achievement goals and achievement, interest also relates to class attendance in academic settings. In a survey of 220 college students, students indicated that the main motivator for attending class was that they considered the instructor, or the material, or both interesting (Gump, 2004). Therefore, in this study interest in psychology should have a direct positive effect on mastery goals and student attendance and a direct negative effect on performance-approach and performance-avoidance goals.

Self-Efficacy Beliefs

Researchers have shown that students' perceptions of self-efficacy have consistently predicted achievement goal orientations (Greene & Miller, 1996; Greene, Miller, Crowson, Duke, & Akey, 2004) and academic performance (Malka & Covington, 2005; Zimmerman & Kitsantas, 2005). Bandura (1986) defined self-efficacy as "people's judgments of their capabilities to organize and execute courses of action required to attain designated types of performances" (p. 395). In academic settings, students' perceived self-efficacy relates to their motivation to start, maintain, and direct behaviors toward academic outcomes, including learning. Students who believe they are competent and will do well on academic tasks are more likely to expend more effort and persist longer than those who believe they are less competent and able (Pintrich & Schunk, 2002).

Researchers have reported links between self-efficacy beliefs and achievement goal orientations (Bong, 2001; Fenollar et al., 2007; Greene et al., 2004; Vrugt, Langereis, & Hoogstraten, 1997; Vrugt, Oort, & Zeeberg, 2002). Elliot (1999) has argued that students with

high perceived self-efficacy tend to adopt both mastery and performance-approach goals and show high achievement, whereas those with low perceived self-efficacy tend to exert less effort and perform poorly. Vrugt et al. (1997) and Vrugt et al. (2002) found support for Elliot's claims. In addition, Fenollar et al. (2007) found a direct positive effect of self-efficacy beliefs on mastery goal orientation and a direct negative effect of self-efficacy beliefs on performance-avoidance goal orientation. The researchers found no direct relationship between perceived self-efficacy and performance-approach goals. Additional research is needed to examine these important relationships between perceived self-efficacy and achievement goal orientations. On the basis of the findings above, I hypothesized that perceived self-efficacy has a direct positive effect on mastery and performance-approach goal orientations and a direct negative effect on performance-avoidance goal orientation.

Researchers have shown that self-efficacy beliefs relate to students' cognitive strategy choice (Fenollar et al., 2007; Greene & Miller, 1996; Miller, Greene, Montalvo, Ravindran, & Nichols, 1996). Students who feel confident in their abilities to succeed in academic settings are more likely to engage themselves in thinking and learning than those who are less confident (Pintrich, 1999; Pintrich & Schrauben, 1992). Several researchers have shown that perceived self-efficacy is positively related to deep processing strategies in educational settings (e.g., Greene & Miller, 1996; Miller et al., (1996); Salomon, 1984). Felonar et al. (2007) found that perceived self-efficacy had a direct positive effect on deep processing cognitive strategies and a direct negative effect on surface processing strategies. These findings support Bandura's (1986) claim that those high in perceived self-efficacy will choose behavioral strategies that help them attain desired outcomes. According to these findings, I expected that self-efficacy beliefs have a

direct positive effect on deep processing cognitive strategies and a direct negative effect on surface processing strategies.

Test Anxiety

Although many believe ability and motivation are the primary predictors of academic performance, some researchers have reported evidence that test anxiety is also related to academic achievement (Seipp, 1991; Zeidner, 1998). Test anxiety has been defined as "the set of phenomenological, physiological, and behavioral responses that accompany concern about possible negative consequences or failure on an exam or similar evaluative situation" (Zeidner, 1998, p. 17). Theorists have disagreed as to the best way to operationalize and measure test anxiety. Instead of viewing test anxiety as one global dimension, some researchers have found it helpful to conceptualize test anxiety in four dimensions, namely, worry, tension, bodily symptoms, and test irrelevant thoughts (Benson & El-Zahhar, 1994). Some researchers, however, have demonstrated that the more cognitive measures of anxiety (worry and test irrelevant thoughts) were most predictive of academic performance (McIlroy & Bunting, 2002).

Although researchers have failed to agree on the cognitive processes that account for the relationship between test anxiety and achievement, the finding that test anxiety affects academic performance is robust (Seipp, 1991; Stowell & Bennett, 2010; Zeidner, 1998). Seipp (1991) conducted a meta-analysis of 126 studies and found a negative correlation of $r = -.21$ between test anxiety and academic performance. On a practical level, Seipp found that students with low test anxiety outscored those with high test anxiety by almost a half of a standard deviation on academic assessments. In addition, McIlroy and Bunting reported negative relationships between test anxiety variables and test performance ($r = -.34$ for test irrelevant thoughts and test performance; $r = -.35$ for worry and test performance), confirming previous research findings (e.g., Zeidner, 1998). Stowell and Bennett (2010) studied 68 students in a psychology course and

found that test anxiety predicted exam performance in classroom (r = -.57) and online (r = -.28) settings. On the basis of these findings, I predicted that cognitive measures of test anxiety are negatively related to performance on exams in this study.

Course Engagement

Students' choice of study strategies and varying levels of engagement affect academic achievement. Researchers have reported that students who use more elaborative learning strategies (i.e., connecting new information to previously learned information) perform better academically than those who use more surface strategies (i.e., rehearsal) (Albaili, 1998; Elliot & McGregor, 2001; Elliot et al., 1999; Fenollar et al., 2007). Researchers measure student engagement in a variety of ways including attendance and participation in course activities. Those students who attend more classes tend to perform better academically than those who do not attend (Gunn, 1993; Snell, Mekies, & Tesar, 1995). Students who perform better on homework and course activities also perform better than those who perform worse (Cooper, 1989; Cooper, Robinson, & Patall, 2006; Paschal, Weinstein, & Wahlberg, 1984; Shernoff, Csikszentmihalyi, Schneider, & Shernoff, 2003; Trautwein, 2007). In these sections, I review the literature regarding learning strategies, attendance, homework, and course activities as it relates to this study.

Learning Strategies

Effective learning depends on students' ability to regulate and evaluate their understanding. Individual differences in the type of learning strategies students use relate to achievement. Although many students depend on rehearsal strategies, such as repeating terms over and over to learn them, others use more elaborative techniques that connect new information to existing knowledge. Researchers have reported that learning strategies mediate the relationship between achievement goals and exam performance (see Fenollar et al., 2007;

Vrugt & Oort, 2008). Undergraduates who adopt mastery goals tend to use more elaborative, deep processing strategies than students who are more concerned with performance (Albaili, 1998; Elliot & McGregor, 2001; Elliot et al., 1999). Researchers have reported mixed results regarding the relationships between performance-approach and performance-avoidance goals with learning strategies. Many researchers failed to find relationships between performance goals and learning strategies, however, other researchers noted that many failed to make the distinction between performance-approach and performance-avoidance goals (Elliot et al., 1999; Wolters, 2004). When making the distinction between performance-approach and performance-avoidance goals, some researchers have found that performance-approach goals relate positively to the use of rehearsal strategies (see Dupeyrat & Martiné, 2005; Elliot et al., 1999) whereas other researchers have found that performance-approach goals relate positively to elaborative techniques (Wolters, 2004).

Researchers have reported that learning strategies mediate the relationship between achievement goals and academic performance. Albaili (1998) found that performance goal orientation had a direct negative relationship to GPA, whereas learning goal orientation had an indirect relationship to GPA mediated by elaborative learning strategies and organization. As mentioned previously, Fenollar et al. (2007) reported that learning strategies mediated the relationship between achievement goals and academic performance. Specifically, Fenollar et al. reported that elaborative learning strategies mediated the relationship between mastery goals and achievement. Fenollar et al. also found that performance-approach goals predicted surface processing (rehearsal strategies), but rehearsal strategies did not predict achievement. Performance-avoidance goals did not predict learning strategies. These findings support earlier research that demonstrated that the relationship of learning goal orientation to achievement was

mediated by elaborative learning strategies (Greene & Miller, 1996; Nolen, 1988). Although the research on this topic is correlational and prior knowledge and ability are not typically controlled, these findings suggest that the uses of more elaborative learning strategies should be positively related to scores on exams.

Attendance

It seems likely that students who attend more classes perform better on assessments than those who attend less, and research has shown that class attendance is related to academic achievement (Gunn, 1993; Snell, et al., 1995; Shimoff & Catania, 2001). Snell et al. found that students who attended 95% of the lectures in social science courses were more likely to earn grades of A or B than those who attended less, even when students dropping out of the course was controlled. Gunn reported a correlation of $r = .66$ between attendance and achievement in introductory psychology courses. Shimoff and Catania (2001) found that students who were required to sign in at each class session attended introductory psychology courses more frequently and answered lecture-based and text-based questions on weekly quizzes more accurately than students not required to sign in.

However, not all research has found a significant relationship between attendance and achievement (Hardy et al., 2003). Hardy et al. acknowledged that their use of self-report data for attendance may have affected the results and suggested that other researchers make an effort to collect behavioral data regarding class attendance to get more accurate estimates of the relationship between attendance and achievement. Most of the research linking attendance to achievement has relied on correlational data. The relationship between attendance and achievement might be explained through their association with other variables, including interest in course material (Gump, 2004) and mandatory attendance policies (Gump, 2004). In a pilot study, I found that attendance did not directly predict exam performance, but had an indirect

effect on exam performance through course assignments (homework, course activities, and quizzes). In this study, I recorded attendance for each class period rather than using students' self-report data. With a behavioral measure of attendance, I expected attendance is positively related to performance on homework, course activities, and quizzes.

Homework

Homework, defined as "a teacher-initiated method for directing students to study more effectively on their own outside of the school" (Bembenutty, 2005, p. 1), has been associated with positive academic outcomes (Cooper, 1989; Cooper, et al., 2006; Paschal, et al., 1984; Trautwein, 2007). It seems plausible that homework assignments would be related to achievement. Homework should increase exposure to course material, focus students on the most important aspects of content, and allow students to practice self-initiated learning. Cooper et al. (2006) reported a synthesis of homework research between 1987 and 2003. Cooper et al. reported beta weights between .05 and .28 that linked homework and achievement for studies involving high school students. However, most of the research reviewed by Cooper et al. involved self-reported time spent on homework rather than actual homework data. The researchers suggested that future researchers use actual homework performance to predict achievement. In light of these suggestions, I planed to investigate the relationship between homework and exam performance within the context of a model that includes prior knowledge (psychology pretest) and ability (GPA and reading ability), test anxiety, and motivation (implicit beliefs about intelligence, perceived self-efficacy, achievement goals, and interest) variables. I expected to find that homework performance relates positively to performance on exams.

Course Participation

Students' learning varies according to the extent of their involvement in course activities in class. Shernoff et al. (2003) reported that highly challenging course activities (e.g., solving a

problem in a group) promoted higher engagement than low challenge activities (e.g., listening to lecture), and students reported more engagement when perceived control and task relevance were high. In addition, Marks (2000) reported that authentic work (work that students perceived as relevant to their goals) increased engagement by encouraging higher order thinking, depth of knowledge, and in class discussions of material. Although some instructors may provide challenging class activities and increase task relevance, background variables like ability, motivational, and personality influence whether students become fully engaged. Many measures of student engagement in class exist, including self-report measures (see Handelsman, Briggs, Sullivan, & Towler, 2005) and more behavioral measures, like the quality of written responses to reflective questions, note taking, and summaries of group activities. By examining such measures of engagement in class activities researchers may avoid the social desirability bias of self-report measures. As stated previously, Hardy et al. (2003) found that course involvement variables (attendance and participation) did not predict exam performance. Other researchers, however, have reported a link between course involvement and exam performance (see Hill, 1990). Hardy et al. acknowledged that their use of self-report data on course involvement may have affected the results and suggested that other researchers make an effort to collect objective data regarding lecture note taking to get more accurate estimates of class involvement. In my study, I measured course participation by reviewing students' lecture and class activity notes for accuracy of information. Utilizing these behavioral measures of student involvement, I hypothesized that students who complete course activities more accurately perform better on exams than those who are less accurate.

Quizzes

Researchers have shown that quizzes relate to exam performance when quiz content is aligned with exam content. Some instructors use unannounced quizzing ("pop quizzes"),

whereas others use announced quizzes as motivation for students to study more frequently and gain vital feedback regarding mastery of the course material. Frequent quizzing tends to reduce the fixed-interval effect, that is, the tendency of students to study with greater frequency right before an exam then cease studying until the next exam, in courses where instructors use only exam scores to calculate final course grades (Passer & Smith, 2001). Thus, quizzes may serve two functions: providing necessary feedback and encouraging more regular studying.

Researchers have presented mixed results from studies examining the relationship of announced quizzes on exam performance. Some researchers have reported that announced quizzes improved performance on exams (Geiger & Bostow, 1976; Johnson, Joyce, & Sen, 2002; Lass, Morzuch, & Rogers, 2007; Noll, 1939), whereas others have reported no effect (Azorlosa & Renner, 2006; Lumsden, 1976; Wilder, Flood, & Stromsnes, 2001). Johnson et al. (2002) reported that students who spent more time repeatedly taking online quizzes performed better on course exams than those who spent less time taking online quizzes. Similarly, Lass, Morzuch, and Rogers (2007) reported that feedback from online quizzes was associated with small increases in course exam scores. In contrast, Azorlosa and Renner (2006) reported that students reported studying more and feeling more prepared for exams in sections that included announced quizzes. However, the researchers reported that there were no differences in exam performance between quiz and no-quiz sections. A serious flaw in the study, however, was the inconsistency between quiz format (multiple choice) and exam format (essay) and the practice of providing the exam questions several weeks prior to the exam. It seems that students in the quiz and no-quiz sections would be able to successfully prepare for the exam questions regardless of which condition they were in.

In this study, I examined the relationship between quizzes and exams where quiz and exam formats were similar, and where quiz feedback provided students with information about their mastery of course objectives. I hypothesized that students who perform well on quizzes in the course also perform well on exams.

Research Question

The research question investigated in this study was does prior knowledge, ability (GPA, reading ability), motivation (implicit theories of intelligence, achievement goal orientation, interest), test anxiety, and course engagement (learning strategies, attendance, homework, course participation, quizzes) predict performance on course examinations in community college psychology courses, with ethnicity, gender, number of college credits earned, and age controlled. Figure 2-2 presents a theoretical model of the relationships that were tested in this study.

Hypotheses

The following hypotheses were examined in the study.

- **Hypothesis 1.** Students who enter community college psychology courses with greater prior knowledge of the subject matter perform better on course assignments (homework, course participation, and quizzes) and exams than those with less knowledge.

- **Hypothesis 2**. Prior GPA has a direct positive effect on exam performance and an indirect effect on exam performance through course assignments (homework, course participation, and quizzes).

- **Hypothesis 3.** Reading ability as measured by college entrance exam reading scores relates positively to achievement on course assignments (homework, course participation, and quizzes) and exam performance.

- **Hypothesis 4**. Implicit theories of intelligence of students relate to their achievement goal orientation. Specifically, those with entity theories of intelligence are more likely to adopt performance goal orientations, whereas those with incremental theories of intelligence are more likely to adopt mastery goals.

- **Hypothesis 5a.** Students with performance goal orientations are more likely to use shallow processing learning strategies (rehearsal), whereas those with mastery goals are more likely to use deeper processing learning strategies (elaboration).

- **Hypothesis 5b.** Achievement goals predict performance on course assignments (homework, class participation, and quizzes). Students' mastery and performance-approach goals have a direct positive effect on course assignments. Performance-avoidance goals have a direct negative effect on course assignments.

- **Hypothesis 5c.** Students who adopt mastery goal orientations report lower levels of test anxiety than those who adopt performance goals.

- **Hypothesis 6a.** Interest has a direct positive effect on mastery goal orientation and has a direct negative effect on performance-approach and performance-avoidance goal orientations.

- **Hypothesis 6b.** Interest predicts class attendance. Students with higher interest in the course material are more likely to attend class than those with less interest.

- **Hypothesis 6c.** Interest predicts cognitive learning strategies. Students with higher interest levels are more likely to use elaborative learning strategies than those with less interest. Those students with lower interest levels are more likely to use rehearsal strategies than those with higher interest.

- **Hypothesis 7a.** Perceived self-efficacy has a direct positive effect on mastery and performance-approach goal orientations and a direct negative effect on performance-avoidance goal orientation.

- **Hypothesis 7b.** Perceived self-efficacy has a direct positive effect on deep processing cognitive strategies and a direct negative effect on surface processing strategies.

- **Hypothesis 8.** Students who report higher levels of test anxiety perform worse on exams than those who report lower levels of test anxiety.

- **Hypothesis 9.** Students who utilize more elaborative learning strategies perform better on exams than those who use rehearsal strategies.

- **Hypothesis 10.** Students who attend more classes perform better on homework, course participation, and quizzes.

- **Hypothesis 11.** Students who perform better on homework and class participation assignments perform better on exams.

- **Hypothesis 12.** Students who perform better on quizzes perform better on exams.

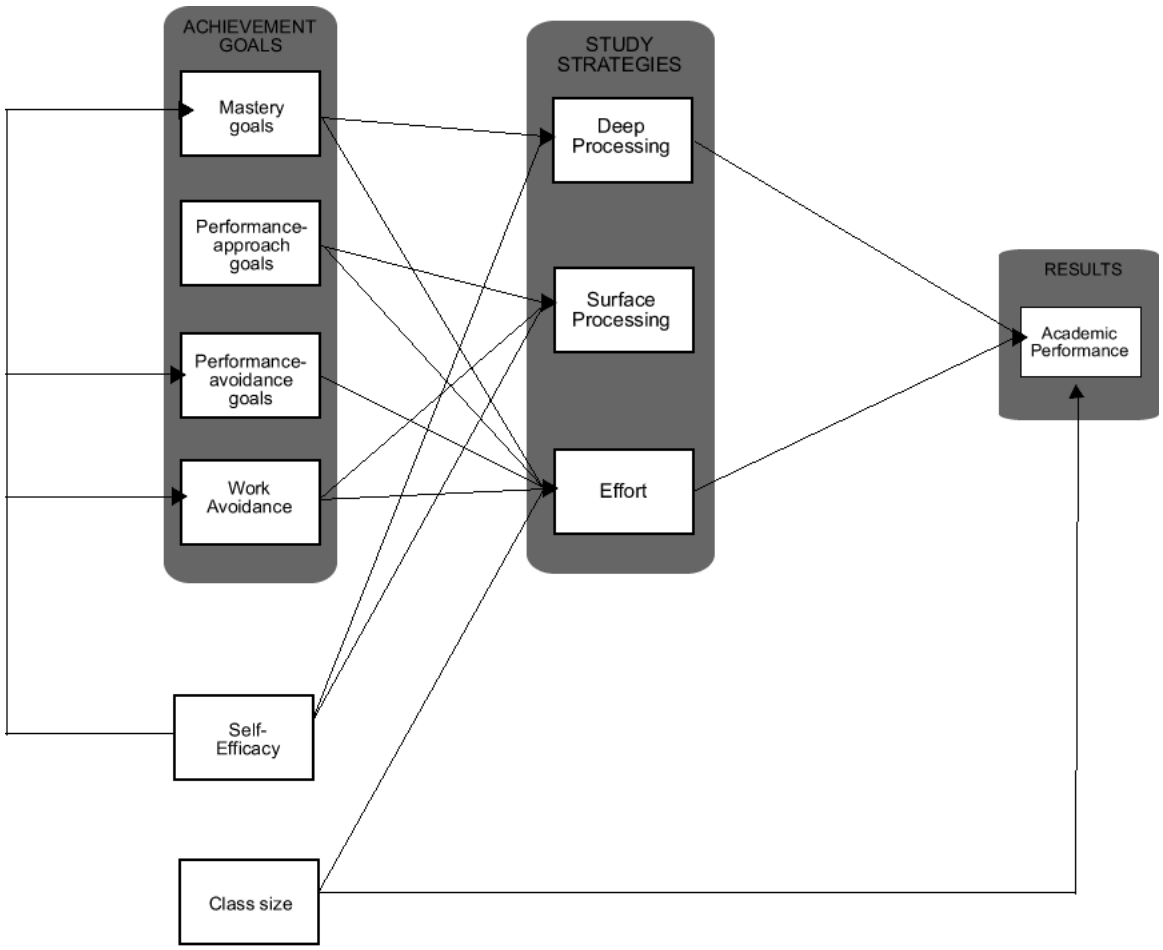

Figure 2-1. Final structural equation model of Fellonar et al. (2007). [Adapted from Fenollar et al. (2007). The final structural equation model. (Page 883, Figure 2). The British Psychological Society: Leicester, United Kingdom.]

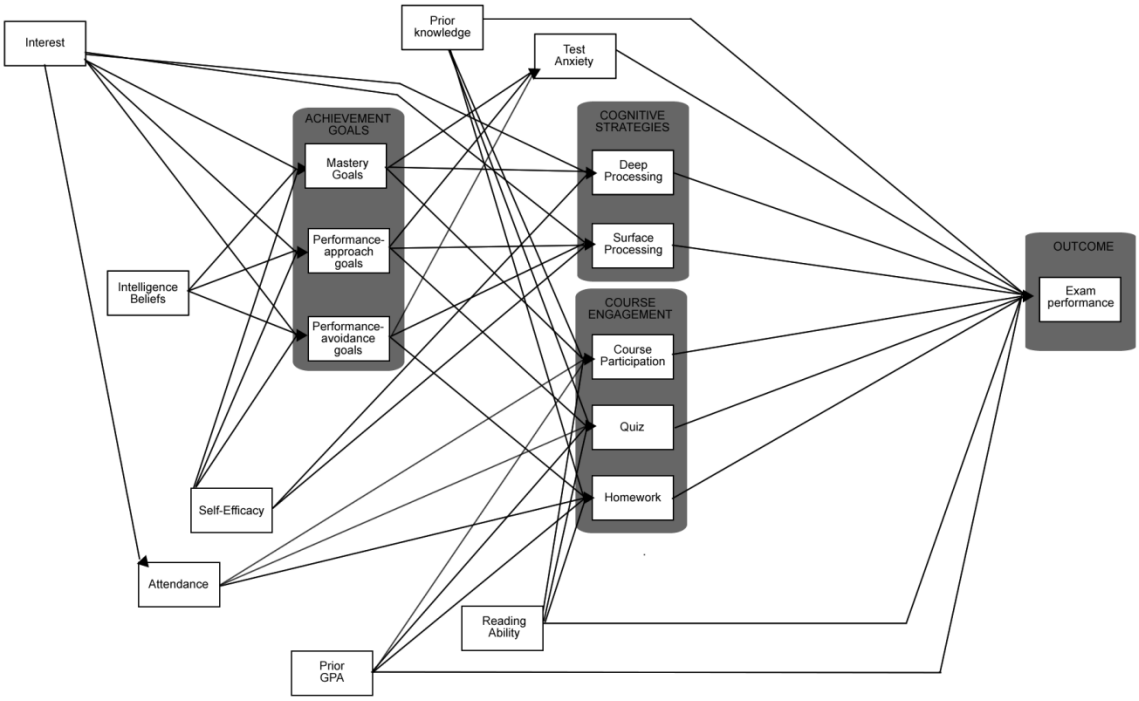

Figure 2-2. Theoretical model of relationships of students' cognitive, motivational, test anxiety, and course engagement characteristics to performance on exams.

CHAPTER 3
METHOD

Participants

A convenience sample of approximately 270 undergraduates enrolled in my psychology courses (General Psychology, Developmental Psychology, The Psychology of Social Behavior) at a community college during the spring 2008 (January through May) semester were asked to participate in the study. The students ranged in age from traditional-aged college students to mature students of non-traditional ages. Although some high-school students were enrolled in these classes, their scores on the measures were not included in the study because of the difficulty of seeking parental consent for their participation in the study and the likelihood that some parents would refuse participation possibly creating a systematic bias in the results of the study.

Measures

Psychology Knowledge Pretest

An examination consisting of multiple-choice questions from the unit exams in the course was administered to students during the first week of classes. To obtain a more accurate measure of students' pre-course content knowledge, they were asked not to guess if they did not know the answer to a question. A "Don't know" response option was included for each question for students to choose if they were not reasonably sure they knew the answer to the question.

College GPA

College GPA was obtained from the students' transcript in the college's mainframe system.

Reading Ability

Reading ability was assessed using college placement test scores on the reading section of the ACT or The Accuplacer College Placement Test (CPT). The CPT was developed by the College Board to provide academic readiness information. This computerized placement test adapts to the tester's skill level and automatically determines which questions are asked based upon answers to previous questions. The CPT is not a timed test. There are four tests available: Reading Comprehension, Sentence Skills, Arithmetic and Elementary Algebra. A concordance table was used to translate CPT reading scores to ACT equivalents (Aims Community College, 1999).

Implicit Theories of Intelligence

A 3-item scale published in Dweck, Chiu, and Hong (1995) was used to measure implicit theories of intelligence. Participants indicated their agreement with the three statements that measure entity theories of intelligence on a 6-point Likert-type scale ranging from (1) *strongly agree* to (6) *strongly disagree* (e.g., "Your intelligence is something about you that you can't change very much"). Jagacinski and Duda (2001) reported a Cronbach's alpha of .91 for the scores of 393 undergraduates.

Achievement Goal Orientation

The achievement goals questionnaire by Elliot and Church (1997) was used to assess achievement goals for the course. This questionnaire consists of six questions for each of the three achievement goals in the goal orientation framework. For mastery goals, for instance, participants indicated their agreement with statements concerning their desire to understand the course material (e.g., "I desire to completely master the material presented in this course"). For performance-approach goals, items refer to the extent to which students are focused on

demonstrating their competence to others by achieving high grades (e.g., “It is important to me to do well compared to others in this class.”)

Interest and Learning Strategies

Three subscales of the *Motivated Strategies for Learning Questionnaire (MSLQ)* (Pintrich, et al., 1991) comprising 16 questions representing task value (interest) and cognitive strategy use (rehearsal and elaboration) were used in the study (Pintrich, et al., 1991). Internal consistency estimates reported by Pintrich et al. of the factor scores to be used in this study reported in the MSLQ test manual are as follows: Task Value, $\alpha = .90$, Rehearsal, $\alpha = .69$, Elaboration, $\alpha = .76$.

Self-Efficacy Beliefs

The Self-Efficacy for Learning and Performance subscale of the MSLQ was used in this study (Pintrich et al., 1991). Nine questions comprise the scale upon which participants indicated their agreement with statements on a 7 point scale from 0 (*not at all true of me)* to 7 (*very true of me*). Sample items included “I expect to do very well in this class” and “I'm certain I can understand the ideas taught in this course”. Pintrich et al. reported a Cronbach alpha of .93 for a sample of 380 university and community college students.

Test Anxiety

The Revised Test Anxiety Scale (Benson & El-Zahhar, 1994) is a four-factor 20-item scale. The four factors include Worry (6 items), Tension (5 items), Bodily Symptoms (5 items), and Test-Irrelevant Thoughts (4 items). Participants respond to the items on a 4-point Likert-type scale ranging from (1) *almost never* to (4) *almost always*, with higher scores indicating higher levels of test anxiety. Only the Worry (e.g., “During the test I think about how I should have prepared for the test”) and Test-Irrelevant Thinking (e.g., “During the tests I find myself thinking of things unrelated to the material being tested”) factors were measured in this study because

prior research has demonstrated that these cognitive measures of anxiety are most predictive of academic performance (McIlroy & Bunting, 2002). Benson and El-Zahhar reported reliability estimates of .84 for the Worry scores and .81 for the Test-Irrelevant Thinking scores of 202 American undergraduate students. Because both of these scales measure cognitive distractions while taking a test, the Worry and Test-Irrelevant Thought item scores were combined and used as a global indicator of test anxiety.

Class Attendance

Class attendance was measured by collecting student signatures on a sign-in sheet each class period throughout the semester. Attendance scores were calculated for each participant by multiplying the number of days attended by a variable that standardizes the attendance scores for students who attended 3 days a week for 50-minute periods with students who attended 2 days a week for 75-minute periods. Attendance scores were summed creating an overall attendance total for each student.

Homework Assignments

Each week, students answered five open-ended conceptual questions that required them to apply their understanding of concepts in the reading to concrete scenarios. Homework assignments were collected weekly and assigned a score that reflects the accuracy of the students' responses. All homework scores were added together to create an overall homework total for each student.

Course Participation

I prepared and distributed a course packet for students that included detailed unit learning objectives, an outline for course lectures, in-class group activities, in-class reflective writing activities, and out-of-class learning activities. Students were required to complete the exercises in the course packet for participation points. At the end of each unit, the instructor collected and

reviewed the course packets and assigned a score based on the accuracy and thoroughness of the responses. A course participation score was calculated by summing the total of all course participation points earned by each student.

Exams

Exam scores served as the outcome variable in this study. Four assessments were administered during the course in the form of unit exams. Each unit exam consisted of information covered only in the specified unit. Cumulative exams were not administered. The exams consisted of multiple-choice questions and essay questions. Each participant had one overall exam score comprised of the sum of all four course exam totals.

Procedures

At the beginning of the semester, students were asked to sign a consent form if they agreed to give their permission for me to use their data in my dissertation study. Students were required to complete all the measures to be used in this study as part of the course whether they signed the consent form or not. Students were asked to complete the Psychology Knowledge Pretest and the measures of interest, goal orientation, test anxiety, and implicit theories of intelligence during the first week of class using WebCT, electronic software that allows students to take surveys, exams, and quizzes online. As the instructor of the courses, I did not have access to the results of the measures listed above or knowledge of which students consented to participate in the study for the duration of the semester to reduce experimenter biases.

Data on attendance, homework, participation, quizzes, and exams were collected during the semester. Pre-semester GPAs and reading admission test scores were obtained on each student during their enrollment in the course from the college's mainframe system.

CHAPTER 4
ANALYSIS OF DATA

The purpose of this study was to test a model of student achievement to see whether students' prior knowledge and ability (GPA, reading ability), motivation (implicit theories of intelligence, achievement goal orientation, interest), test anxiety, and course engagement (learning strategies, attendance, homework, course participation, quizzes) predict performance on course examinations in community college psychology courses, with ethnicity, gender, number of earned college credits, and age controlled. In this chapter, I report the descriptive statistics, tests of the hypothesized model, revisions to the model, and outcomes of the tests of the research hypotheses.

Descriptive Statistics

The sample consisted of 210 undergraduate students enrolled in psychology courses at a community college in the southeastern United States. More female students (75%) participated in the study than males (25%). Most of the students identified their ethnicity as White (73%). The remaining participants identified themselves as Hispanic (12%), Black (8%), American Indian (5%), Asian (0.5%), and other (1.4%). Age of the participants ranged from 18 to 61, with a mean of 21. The mean number of college credit hours earned by the participants was 35. Participants were enrolled in one of three psychology courses at the college: General Psychology (50%), Developmental Psychology (35%), or The Psychology of Social Behavior (15%). Means and standard deviations for all of the variables are presented in Table 4-1. The correlations among the variables are presented in Table 4-2.

Analysis of the Proposed Model

I estimated the proposed model using Mplus. I controlled for gender, age, ethnicity, and number of college credit hours earned by including these variables as predictors for all of the

endogenous variables in the model. To control for possible effects due to the differences in courses (General Psychology, Developmental Psychology, The Psychology of Social Behavior), course was used as a predictor of course assignments (homework, class participation, quizzes) and exam performance in the model. The initial goodness of fit test and indices indicated poor model fit, $\chi2$ (91) = 204.26, $p < .01$, comparative fit index (CFI) = .89, Tucker-Lewis index (TLI) = .72, root mean square error of approximation (RMSEA) = .08.

I evaluated modification indices in an effort to improve the fit of the model. The largest modification index was 23.20 indicating that a direct path between GPA and attendance would improve the model fit. I added GPA as a predictor of attendance and re-estimated the model. The revised model still indicated poor fit, $\chi2$ (90) = 179.04, $p < .01$, CFI = .91, TLI = .78, RMSEA = .07. The largest modification index (21.77) indicated that allowing the errors to correlate between perceived self-efficacy and interest would improve the model. However, the test statistics showed the model did not fit the data, $\chi2$ (89) = 155.46, $p < .01$, CFI = .94, TLI = .83, RMSEA = .06. After examining the revised model, I decided to allow the errors of elaboration and rehearsal to correlate based on the large modification index (16.48). I allowed these errors to correlate, ran the analysis again, and improved the model fit. The model fit was still poor despite improvements in the fit indices, $\chi2$ (88) = 138.07, $p < .01$, CFI = .95, TLI = .87, RMSEA = .05. The modification index between homework and participation was 13.99. I added a path between homework and class participation, then re-estimated the model. The goodness of fit test and indices indicated a good fit, $\chi2$ (87) = 122.71, $p < .01$, CFI = .97, TLI = .91, RMSEA = .04. Table 4-3 includes a list of the direct, indirect, and total effects of the relationships tested in the model. Table 3.4 presents the significant and nonsignificant effects for the proposed and revised models.

Research Hypotheses

The proposed research hypotheses were tested with gender, age, ethnicity, and number of earned college credits controlled. This section includes the results of the hypotheses tests. Please see Table 3.4 for a list of direct and indirect effects tested in the model. Specific indirect effects are not presented on Table 3.4 but are presented in the description of the results of the hypotheses tests where these effects were found.

Hypothesis 1 was students who enter community college psychology courses with greater prior knowledge of the subject matter perform better on course assignments (homework, course participation, quizzes) and exams than those with less prior knowledge. Hypothesis 1 was partially supported. Students with greater prior knowledge of psychology performed better on quizzes ($\gamma = .09$; $p = .05$) and exams ($\gamma = .15$; $p < .01$) than those with less prior knowledge. However, prior knowledge did not predict performance on homework or participation.

Hypothesis 2 was prior GPA predicts exam performance and has an indirect effect on exam performance through course assignments (homework, course participation, and quizzes). Prior GPA did not show a direct effect on exam or quiz performance. However, prior GPA had a direct effect on homework ($\gamma = .17$; $p < .01$) and class participation ($\gamma =.25$; $p < .01$). GPA had an indirect relationship with exam through homework and quiz ($\gamma = .03$; $p < .01$). Other significant indirect effects between GPA and exam were mediated through attendance and quiz ($\gamma = .04$; $p < .01$), attendance, homework, and quiz ($\gamma = .03$; $p < .01$), and class participation, homework, and quiz ($\gamma = .01$; $p = .01$). I added a path between GPA and attendance after reviewing modification indices and found a direct effect of prior GPA on attendance ($\gamma = .34$; $p < .01$).

Hypothesis 3 was reading ability as measured by college entrance exam reading scores relates positively to achievement on course assignments (homework, course participation, and quizzes) and exam performance. Reading ability related positively to achievement on homework

($\gamma = .17$; $p < .01$) and exam performance ($\gamma = .41$; $p < .01$). However, reading ability did not predict class participation and quiz performance.

Hypothesis 4 was implicit theories of intelligence of students enrolled in community college psychology courses relates to their achievement goal orientation. Specifically, those with entity theories of intelligence were expected to be more likely to adopt performance goal orientations, whereas those with incremental theories of intelligence were expected to be more likely to adopt mastery goals. Implicit theories of intelligence did not predict whether students were more likely to adopt mastery goals, performance-approach, or performance-avoidance goals.

Hypothesis 5a was students with performance goal orientations are more likely to use shallow processing learning strategies (rehearsal), whereas those with mastery goals are more likely to use deeper processing learning strategies (elaboration). Students with performance-avoidance goal orientations were more likely to report use of rehearsal strategies ($\beta = .23$; $p < .01$). Those with mastery goals were not more likely to report using elaborative learning strategies. Performance-approach goal orientations did not predict whether students were more likely to use rehearsal strategies.

Hypothesis 5b was students' mastery and performance-approach goals have a direct positive effect on performance on course assignments, whereas students' performance-avoidance goals have a direct negative effect on performance on course assignments. Achievement goals did not predict performance on course assignments in this study.

Hypothesis 5c was students who adopt mastery goal orientations report lower levels of test anxiety than those who adopt performance goals. Mastery and performance-approach goal orientations did not predict self-reported anxiety in this study. However, performance-avoidance

goal orientations had a direct positive relationship to test anxiety ($\beta = .44$; $p < .01$). In addition, performance-avoidance goals had an indirect effect on exam performance through anxiety ($\beta = -.06$; $p = .04$).

Hypothesis 6a was interest has a direct positive effect on mastery goal orientation and a direct negative effect on performance-approach and performance-avoidance goal orientations. Interest had a direct positive effect on mastery goal orientation ($\gamma = .54$; $p < .01$). The results also showed that interest had a direct negative effect on performance-avoidance goal orientation ($\gamma = -.18$; $p = .01$). However, interest did not predict performance-approach goal orientation.

Hypothesis 6b was interest predicts class attendance. Specifically, I expected that students with higher interest in the course material would be more likely to attend class than those with less interest. In this study, interest did not predict class attendance.

Hypothesis 6c was participants who indicate higher levels of interest in the course are more likely to use elaborative learning strategies than those with lower interest. As predicted, interest had a direct positive effect on elaboration ($\gamma = .20$; $p < .01$). I also hypothesized a direct negative effect of interest on rehearsal. Interest did not predict rehearsal in this study.

Hypothesis 7a was perceived self-efficacy has a direct positive effect on mastery and performance-approach goal orientations and a negative effect of perceived self-efficacy on performance-avoidance goal orientation. Self-efficacy beliefs had a direct positive effect on mastery ($\gamma = .17$; $p < .01$) and performance-approach ($\gamma = .29$; $p < .01$) goals, and a direct negative effect on performance-avoidance ($\gamma = -.24$; $p < .01$) goals.

Hypothesis 7b was perceived self-efficacy has a direct positive effect of on elaboration strategies and a direct negative effect of perceived self-efficacy on rehearsal strategies. As hypothesized, perceived self-efficacy predicted elaboration ($\gamma = .25$; $p < .01$). Although

perceived self-efficacy predicted rehearsal ($\gamma = .26$; $p < .01$), the relationship was a direct positive relationship rather than the predicted negative relationship.

Hypothesis 8 was students who report higher levels of test anxiety perform less well on exams than those who report lower levels of test anxiety. Consistent with the prediction, anxiety had a direct negative effect on exam performance ($\beta = -.13$; $p = .03$).

Hypothesis 9 was students who use more elaborative learning strategies perform better on exams than those who use rehearsal strategies. In this study, rehearsal did not predict exam performance. However, participants who reported using more elaborative strategies performed better on exams ($\beta = .12$; $p = .04$).

Hypothesis 10 was students who attend more classes perform better on homework, course participation, and quizzes. As expected, attendance predicted accuracy on homework ($\beta = .45$; $p < .01$), class participation ($\beta = .64$; $p < .01$), and quiz performance ($\beta = .27$; $p < .01$). Attendance had a significant indirect effect on exam performance through quiz ($\beta = .11$; $p < .01$), homework and quiz ($\beta = .08$; $p < .01$), and class participation, homework, and quiz ($\beta = .03$; $p < .01$).

Hypothesis 11 was students who perform better on homework assignments and course participation perform better on exams. Homework and course participation did not have direct effects on exam performance. However, I found a significant indirect effect of homework on exam through quiz performance ($\beta = .17$; $p < .01$). I also found a significant indirect effect of course participation on exam through homework and quiz performance ($\beta = .05$; $p < .01$), and the path I added on the basis of modification indices between course participation and homework was significant ($\beta = .28$; $p < .01$).

Hypothesis 12 was students who perform better on quizzes perform better on exams. Quiz performance had a positive direct effect on exam scores ($\beta = .41$; $p < .01$).

Table 4-1. Means and standard deviations

Variable	*N*	*M*	*SD*	Min	Max
Age	210	21.05	5.51	18.00	61.00
College credit hours earned	209	34.65	21.38	0.00	112.00
Reading	178	21.54	4.51	13.00	32.00
GPA	206	3.02	0.72	0.00	4.00
Attendance	210	60.01	10.91	13.92	69.60
Participation	186	368.61	47.42	58.00	400.00
Homework	209	73.32	24.63	0.00	112.00
Quiz	210	292.27	88.83	16.00	400.00
Intelligence beliefs	201	12.55	3.49	3.00	18.00
Anxiety	200	20.43	5.98	10.00	37.00
Mastery goals	201	34.62	4.51	15.00	42.00
Performance-approach goals	202	24.93	8.11	7.00	42.00
Performance-avoidance goals	202	25.94	6.37	6.00	40.00
Elaboration	202	32.21	4.64	19.00	42.00
Rehearsal	203	20.02	4.29	7.00	28.00
Interest	201	35.95	4.10	21.00	42.00
Perceived self-efficacy	203	47.24	5.70	30.00	60.00
Prior knowledge	194	10.78	4.00	0.00	20.00
Exam	184	410.03	52.65	261.60	505.60

Table 4-2. Correlation matrix

	ATT	ANX	MAS	PAP	PAV	ELA	INT	REH	PRT	HWK	QUZ
ATT	1.00										
ANX	-.05	1.00									
MAS	.09	-.10	1.00								
PAP	.01	.04	**.18	1.00							
PAV	.02	***.46	** -.19	.08	1.00						
ELA	.02	.01	***.34	.12	-.04	1.00					
INT	.01	-.01	***.60	.05	**-.22	***.37	1.00				
REH	-.11	.11	.08	.01	*.17	***.36	*.15	1.00			
PRT	***.75	-.08	.09	.03	.02	.07	.04	.01	1.00		
HWK	***.74	*-.16	.11	.04	-.04	.13	.07	.03	***.74	1.00	
QUZ	***.70	**-.20	.14	.01	-.06	.07	.08	-.02	***.68	***.70	1.00
EXM	**.31	***-.33	**.23	-.07	*-.15	**.20	*.16	-.04	***.43	***.47	***.57
SEF	-.04	*-.16	***.35	***.29	***-.30	***.36	***.32	**.18	.01	.03	.02
REA	.06	*-.17	*.19	-.02	-.07	.13	.11	.05	.09	**.21	*.16
GPA	***.34	-.12	.09	-.04	.03	.09	.02	.04	***.48	***.48	**.41
IQB	.00	.04	.06	-.11	.00	.07	.03	.07	-.06	-.01	-.04
PRE	-.05	*-.18	*.16	.06	-.07	**.22	.10	.01	-.02	-.01	.04
CRE	.05	-.10	-.02	-.01	-.05	.11	-.04	-.04	.12	.03	.03
AGE	.03	-.06	.01	-.01	-.09	.09	-.05	.02	-.01	.06	.03

Note. ATT = attendance, ANX = anxiety, MAS = mastery goals, PAP = performance-approach goals, PAV = performance-avoid goals, ELA = elaborative strategies, INT = interest, REH = rehearsal strategies, PRT = class participation, HWK = homework, QUZ = quiz, EXM = exam, SEF = self-efficacy, REA = reading, GPA = prior grade point average, IQB = intelligence beliefs, PRE = pretest, CRE = credit hours earned, AGE = age.
*$p < .05$. **$p < .01$. ***$p < .001$.

Table 4-2. Continued

	ATT	ANX	MAS	PAP	PAV	ELA	INT	REH	PRT	HWK	QUZ
CR1	*.14	-.01	-.09	.08	-.03	.05	-.10	-.01	*.16	***.28	-.04
CR2	.03	-.01	.04	-.08	.05	-.09	.04	-.01	.02	*-.14	**.20
ASI	-.03	.11	**-.18	*-.15	.01	-.03	*-.15	.13	.01	.00	-.01
AMI	.08	-.13	.11	-.03	.00	.08	.03	.04	.09	.09	.04
BLA	.04	.09	-.03	-.03	.05	-.11	-.03	-.05	-.02	-.01	-.12
HIS	-.08	-.04	-.02	-.12	-.09	-.01	-.03	-.04	-.07	-.08	-.02
SEX	-.09	*-.16	.04	.09	*-.18	-.12	*-.14	*-.14	-.18	*-.16	-.04

Note. ATT = attendance, ANX = anxiety, MAS = mastery goals, PAP = performance-approach goals, PAV = performance-avoid goals, ELA = elaborative strategies, INT = interest, REH = rehearsal strategies, PRT = class participation, HWK = homework, QUZ = quiz, CR1 = course 1, CR2 = course 2, ASI = Asian, AMI = American Indian, BLA = Black, HIS = Hispanic, SEX = sex.
*$p < .05$. **$p < .01$. ***$p < .001$.

Table 4-2. Continued

	EXM	SEF	REA	GPA	IQB	PRE	CRE	CR1	CR2	AGE	ASI
EXM	1.00										
SEF	*.15	1.00									
REA	***.54	.06	1.00								
GPA	***.38	.12	**.19	1.00							
IQB	-.11	.03	.00	.02	1.00						
PRE	***.31	**.19	*.18	.10	**-.19	1.00					
CRE	.04	.09	*-.18	.08	.05	.10	1.00				
CR1	-.10	.09	-.05	.10	.06	-.10	.12	1.00			
CR2	.10	*-.15	-.04	-.06	-.05	*-.14	**-.21	***-.73	1.00		
AGE	.02	.03	*-.18	.01	.05	.10	***.37	.07	-.10	1.00	
ASI	-.05	-.09	-.04	-.03	.11	-.05	.09	-.05	-.07	.13	1.00
AMI	.04	-.05	**-.26	.02	.11	.03	**.18	-.08	.10	.01	-.02
BLA	-.13	.01	**-.20	-.05	.00	.06	-.03	.05	.00	.05	-.02
HIS	.00	-.01	-.04	.02	-.02	.03	.06	.04	-.10	.05	-.03
SEX	.11	.04	.11	-.03	-.06	.00	-.08	-.11	.06	-.03	-.04

Note. EXM = exam, SEF = self-efficacy, REA = reading, GPA = prior grade point average, IQB = intelligence beliefs, PRE = pretest, CRE = credit hours earned, CR1 = course 1, CR2 = course 2, AGE = age, ASI = Asian, AMI = American Indian, BLA = Black, HIS = Hispanic, SEX = sex.

*p < .05. **p < .01. ***p < .001.

Table 4-2. Continued

	AMI	BLA	HIS	SEX
AMI	1.00			
BLA	-.07	1.00		
HIS	-.09	-.11	1.00	
SEX	-.04	-.08	.09	1.00

Note. AMI = American Indian, BLA = Black, HIS = Hispanic, SEX = sex.
*$p < .05$. **$p < .01$. ***$p < .001$.

Table 4-3. Total, direct, and indirect effects in revised model

Variable	Effect	INT	ATT	ANX	MAS	PAP	PAV	ELA	REH	PRT	HWK	QUZ	EXM
INT	Total	---	-.01	---	***.54	-.06	*-.18	**.20	.12	---	---	---	---
	Direct	---	-.01	---	***.54	-.06	*-.18	**.20	.12	---	---	---	---
	Indirect	---	---	---	---	---	---	---	---	---	---	---	---
SEF	Total	---	---	---	**.17	***.29	***-.24	***.25	***.26	---	---	---	*.05
	Direct	---	---	---	**.17	***.29	***-.24	***.25	***.26	---	---	---	---
	Indirect	---	---	---	---	---	---	---	---	---	---	---	*.05
REA	Total	---	---	---	---	---	---	---	---	.03	***.17	.05	***.47
	Direct	---	---	---	---	---	---	---	---	.03	***.17	.05	***.41
	Indirect	---	---	---	---	---	---	---	---	---	---	---	*.05
GPA	Total	---	***.34	---	---	---	---	---	---	***.25	***.17	.03	***.25
	Direct	---	***.34	---	---	---	---	---	---	***.25	***.17	.03	.10
	Indirect	---	---	---	---	---	---	---	---	---	---	---	***.16
IQB	Total	---	---	---	.04	-.10	.00	---	---	---	---	---	---
	Direct	---	---	---	.04	-.10	.00	---	---	---	---	---	---
	Indirect	---	---	---	---	---	---	---	---	---	---	---	---
PRE	Total	---	---	---	---	---	---	---	---	.02	-.04	*.09	**.19
	Direct	---	---	---	---	---	---	---	---	.02	-.04	*.09	*.15
	Indirect	---	---	---	---	---	---	---	---	---	---	---	.04
ATT	Total	---	---	---	---	---	---	---	---	***.64	***.45	***.27	***.26
	Direct	---	---	---	---	---	---	---	---	***.64	***.45	***.27	---
	Indirect	---	---	---	---	---	---	---	---	---	---	---	***.26
ANX	Total	---	---	---	---	---	---	---	---	---	---	---	*-.13
	Direct	---	---	---	---	---	---	---	---	---	---	---	*-.13
	Indirect	---	---	---	---	---	---	---	---	---	---	---	---

Note. INT = interest, ATT = attendance, ANX = anxiety, MAS = mastery goals, PAP = performance-approach goals, PAV = performance-avoid goals, ELA = elaborative strategies, REH = rehearsal strategies, PRT = class participation, HWK = homework, QUZ = quiz, EXM = exam, SEF = self-efficacy, REA = reading, GPA = prior grade point average, IQB = intelligence beliefs, PRE = pretest.
*$p < .05$. **$p < .01$. ***$p < .001$.

Table 4-3. Continued

Variable	Effect	INT	ATT	ANX	MAS	PAP	PAV	ELA	REH	PRT	HWK	QUZ	EXM
MAS	Total	---	---	.02	---	---	---	.14	---	.01	-.02	.01	---
	Direct	---	---	.02	---	---	---	.14	---	.01	-.02	.01	---
	Indirect	---	---	---	---	---	---	---	---	---	---	---	---
PAP	Total	---	---	.04	---	---	---	---	-.06	.06	.04	.01	---
	Direct	---	---	.04	---	---	---	---	-.06	.06	.04	.01	---
	Indirect	---	---	---	---	---	---	---	---	---	---	---	---
PAV	Total	---	---	***.44	---	---	---	---	**.23	-.03	-.07	-.04	**-.10
	Direct	---	---	***.44	---	---	---	---	**.23	-.03	-.07	-.04	---
	Indirect	---	---	---	---	---	---	---	---	---	---	---	**-.10
ELA	Total	---	---	---	---	---	---	---	---	---	---	---	*.12
	Direct	---	---	---	---	---	---	---	---	---	---	---	*.12
	Indirect	---	---	---	---	---	---	---	---	---	---	---	---
REH	Total	---	---	---	---	---	---	---	---	---	---	---	-.04
	Direct	---	---	---	---	---	---	---	---	---	---	---	-.04
	Indirect	---	---	---	---	---	---	---	---	---	---	---	---
PRT	Total	---	---	---	---	---	---	---	---	---	***.28	.15	**.11
	Direct	---	---	---	---	---	---	---	---	---	***.28	.15	---
	Indirect	---	---	---	---	---	---	---	---	---	---	---	**.11
HWK	Total	---	---	---	---	---	---	---	---	---	---	***.41	***.17
	Direct	---	---	---	---	---	---	---	---	---	---	***.41	---
	Indirect	---	---	---	---	---	---	---	---	---	---	---	***.17
QUZ	Total	---	---	---	---	---	---	---	---	---	---	---	***.41
	Direct	---	---	---	---	---	---	---	---	---	---	---	***.41
	Indirect	---	---	---	---	---	---	---	---	---	---	---	---

Note. INT = interest, ATT = attendance, ANX = anxiety, MAS = mastery goals, PAP = performance-approach goals, PAV = performance-avoid goals, ELA = elaborative strategies, REH = rehearsal strategies, PRT = class participation, HWK = homework, QUZ = quiz, EXM = exam.
*$p < .05$. **$p < .01$. ***$p < .001$.

Table 4-4. Effects proposed in original model and effects in revised model

Variable	INT	ATT	ANX	MAS	PAP	PAV	ELA	REH	PRT	HWK	QUZ	EXM
INT		-		*	-	*	*	-				
SEF				*	*	*	*	*				
GPA		†							*	*	-	-
IQB				-	-	-						
REA									-	*	-	*
PRE									-	-	*	*
ATT									*	*	*	
ANX												*
MAS			-				-		-	-	-	
PAP			-					-	-	-	-	
PAV			*					*	-	-	-	
ELA												*
REH												-
PRT										†	*	
HWK											*	
QUZ												*

Note. INT = interest, ATT = attendance, ANX = anxiety, MAS = mastery goals, PAP = performance-approach goals, PAV = performance-avoid goals, ELA = elaborative strategies, REH = rehearsal strategies, PRT = class participation, HWK = homework, QUZ = quiz, EXM = exam, SEF = self-efficacy, GPA = prior grade point average, IQB = intelligence beliefs, REA = reading, PRE = pretest.
* = hypothesized relationship that was significant in the revised model
- = hypothesized relationship that was not significant in the revised model
† = significant relationship not proposed in original model

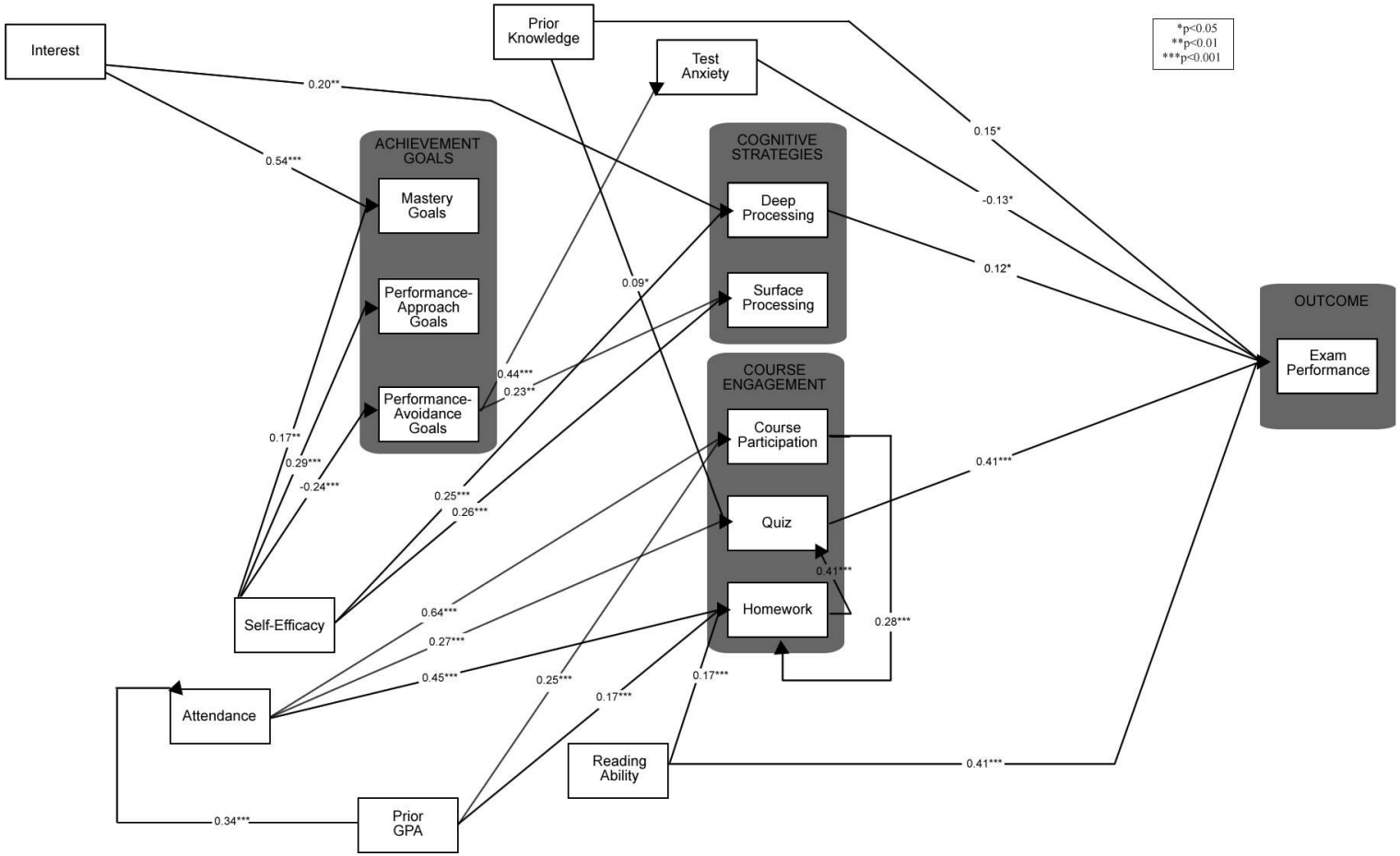

Figure 4-1. Revised model of relationships of students' cognitive, motivational, test anxiety, and course engagement characteristics to performance on exams

CHAPTER 5
DISCUSSION

The purpose of this study is to test a model of the effects of students' cognitive, ability, motivation, test anxiety, and academic engagement individual differences on achievement on exams in undergraduate psychology courses at a community college. Specifically, I hypothesized that students' prior knowledge, ability (GPA, reading ability), motivation (implicit theories of intelligence, achievement goal orientation, interest), test anxiety, and course engagement (learning strategies, attendance, homework, course participation, quizzes) predict performance on course examinations in community college psychology courses, with ethnicity, gender, number of college credits earned, and age controlled. In addition to replicating prior research findings in the area of student achievement, I expanded a model proposed by Fenollar et al. (2007) by adding variables and including student performance on course assignments in lieu of a self-reported measure of student effort. In this chapter, I discuss the results of this study as they relate to prior research and discuss implications for theory and practice. In addition, I suggest directions for future research.

Prior Knowledge and Ability

The findings from this study provide evidence that, as expected, variation in background knowledge and ability predict academic achievement. Of all the variables included in the model, students' reading ability and quiz performance have the largest direct effects on their performance on exams. This finding is consistent with prior research (see Fields & Cosgrove, 2000; Gerow & Murphy, 1980; Jackson, 2005; Kessler & Pezzetti, 1990; Roberts et al., 1990). I also found support for prior studies that have shown that students with prior knowledge of a subject tend to perform better on quizzes and exams than those with less prior knowledge (see Alexander et al., 1994; Hudson & Rottmann, 1981). Some researchers using correlational

analysis have reported that overall college GPA predicts exam performance in college psychology courses (Hardy, et al., 2003), in my study GPA only has a direct effect on course assignments (homework and class participation) and has an indirect effect on exam performance through course assignments. In this section, I discuss the results in the areas of prior knowledge, GPA, and reading comprehension as they relate to prior research and make recommendations for future research.

Prior Knowledge

Consistent with prior research (Alexander et al., 1994; Hudson & Rottmann, 1981; Thompson & Zamboanga, 2003, 2004), the results of this study support the hypothesis that students with greater prior knowledge of psychology perform better on course assessments than those with less knowledge. Specifically, pretest scores predict scores on quizzes and exams. This finding lends support to the information processing theories proposed by Baddeley and Hitch (1974) and Cowan (1998) that describe how prior knowledge facilitates learning.

Contrary to theory, the analysis does not show that prior knowledge predicts accuracy on homework or class participation. If prior knowledge predicts learning and performance on course activities, one would expect significant relationships among pretest with homework and class participation scores. Alternative theories may account for the relationship between prior knowledge and performance on quizzes and exams. The relationship between the pretest, quizzes, and exam scores may be affected by test taking skills in addition to accurate prior knowledge. In this study, the pretest, quizzes, and exams were comprised primarily of multiple choice questions (exams included one written response question in addition to the multiple choice questions). Homework and class participation assignments were open-ended questions that required written responses. Some students have better test taking skills for multiple choice tests than others (e.g., variability in the ability to narrow down choices to facilitate better

guessing) which may have contributed to the congruence in scores between the pretest, quizzes, and exams (see Samson, 1985). Due to the conflicting findings in this study, additional research is needed to control for test taking skills when estimating the relationship between prior knowledge and learning.

College Grade Point Average

In contrast to findings reported by Hardy et al. (2003), prior college GPA does not have a direct effect on exam or quiz performance in this study. However, the findings of this study support the unconfirmed hypothesis tested by Hardy et al. that the relationship between prior GPA and exam performance is mediated by course attendance and performance on course assignments. Prior GPA predicts performance on homework and class participation. In addition, GPA has a significant indirect effect on exam. The effect of GPA on exam is mediated through the following paths: homework and quiz; attendance and quiz; attendance, homework, and quiz; class participation, homework, and quiz; and attendance, class participation, and quiz.

Differences in the findings of this study and the research of Hardy et al. (2003) may be due to differences in measures of course engagement. Hardy et al. used a self-report measure of attendance and lecture involvement along with instructor-reported homework scores to estimate student involvement in the course. In addition, Hardy et al. asked students to report their own GPAs and college placement test scores. In this study, I obtained actual attendance records, student generated class notes, homework scores, and quiz grades to measure students' engagement in the course and obtained college GPAs from student records rather than having participants estimate them. In sum, I relied less on self-report data as measures of ability and class engagement that may be subject to biases and errors (e.g., inaccurate memories, social desirability). Hardy et al. had a smaller sample size (N = 108) than the sample size in this study (N = 210). In sum, future studies should further examine the relationship between GPA and exam

performance in light of the conflicting findings between this study and other studies showing effects of GPA on achievement.

Reading Comprehension

On the basis of prior research linking reading comprehension to exam performance (Fields & Cosgrove, 2000; Gerow & Murphy, 1980; Jackson, 2005; Kessler & Pezzetti, 1990; Roberts et al., 1990), I predicted that students' reading ability as measured on initial college placement exams predicts their scores on homework, class participation, quizzes, and exams. Of all the variables included in the model, reading ability has the largest effect on students' exam performance. In addition, I found reading ability predicts achievement on homework. However, reading ability does not predict class participation and quiz performance.

Several possibilities might account for these mixed findings. First, homework assignments in this study were completed prior to lectures, and students had to read the textbook to answer the questions accurately. Reading comprehension most likely plays a larger role in assignments where students must rely on text to generate their responses. Class participation assignments were less text dependent. Participants worked together in groups and relied more on lecture presentations than text for class participation activities.

Second, the main difference between quizzes and exams involves the time allotted for each assessment. Quizzes are administered online through a learning management system and are timed, whereas exams are administered in class and are not timed. Researchers have reported mixed results regarding how timed tests affect reading comprehension and achievement. Some researchers have reported that timed tests reduce reading comprehension and performance of students with learning disabilities and normally achieving students (e.g., Halla, 1998). However, other researchers have reported that students with learning disabilities make larger gains than normally achieving students when assessments are not timed versus timed (e.g., Lesaux, Pearson,

& Siegel, 2006). Students with learning disabilities tend to suffer greater deficits in performance than normally achieving students when tests are timed. Future studies should examine how reading skill affects different types of assignments in addition to continuing to examine how time constraints may interfere with reading comprehension in students with learning disabilities and normally achieving students.

Motivation

Motivation variables did not predict performance on exams, but some motivation variables had indirect effects on exam performance through other variables in the model. Results do not support Dweck's (2000) concept of implicit theories of intelligence. However, interest and perceived self-efficacy predict achievement goal orientation and cognitive strategy use. Concerning achievement goals, this study adds support to previous findings regarding links between performance-avoidance goals and the use of rehearsal strategies. However, performance-approach goals fail to predict cognitive strategies in this study contrary to findings of other researchers (see Elliot, 1997, 1999; Fenollar et al., 2007). Last, performance-avoid goals predict self-reported test anxiety. However, mastery goals and performance-approach goals do not predict anxiety. In the following section, I discuss the effects of the motivation variables in the model and make recommendations for future studies.

Implicit Theories of Intelligence

On the basis of Dweck's (2000) research, I hypothesized that students' implicit theory of intelligence predict their achievement goal orientations. Dweck reported that students with an entity theory of intelligence were more likely to adopt performance goal orientations, whereas those with an incremental theory of intelligence were more likely to adopt mastery goals. In this study, students' implicit theory of intelligence does not predict whether they are more likely to adopt mastery goals, performance-approach, or performance-avoidance goals.

The lack of a relationship between students' theories of intelligence and achievement goals in this study may be due at least in part to the lack of variance in the scores on the measure of students' theories of intelligence. Other researchers have found weak or nonsignificant relationships between theories of intelligence and achievement goals (e.g., Dupeyrat & Mariné, 2005; Spinath & Stiensmeier-Pelster, 2001). Dupeyrat and Mariné reported that entity and incremental theories of intelligence did not predict performance goals in their study of adults in a program earning the equivalency of a high school diploma. Contrary to the model proposed by Dweck (2000), Dupeyrat and Mariné found that students with entity beliefs about intelligence were less likely to adopt mastery goals. Dupeyrat and Mariné suggested that researchers explore other predictors of achievement goal orientation and examine Dweck's conceptualization of entity and incremental theories of intelligence as one continuous and unidimensional construct. It is possible that people view some aspects of intelligence as fixed and some as malleable. In this study, other motivation variables were included as predictors of achievement goals, namely, interest, and perceived self-efficacy. Both interest and perceived self-efficacy predict achievement goals. Interest has a direct positive effect on mastery goal orientation and a direct negative effect on performance-avoidance goal orientation. Perceived self-efficacy predicts mastery, performance-approach, and performance-avoidance goals. In light of the findings of this study, further research in this area should include student, instructor, and course structure variables that might predict achievement goal orientation.

Achievement Goal Orientation

In support of the achievement goal theory of Elliot et al. (1999), I found that performance-avoidance goal orientations predict the use of rehearsal strategies. The findings support the theory that students who adopt performance-avoidance goals are more likely to make use of more shallow-processing strategies. In contrast to goal theory, in this study mastery goals do not

predict elaborative learning strategies, although the effect approached significance, with a probability of .08. The relationship between mastery goals and elaboration reported by Fenollar et al. (2007) may have been modified by the inclusion of interest as a predictor of elaboration in the present study. I found that interest and perceived self-efficacy are stronger predictors of elaboration than mastery goals.

Inconsistent results have been reported in the literature regarding the link between performance-approach goals and cognitive strategies (see Meece, Blumenfeld, & Hoyle, 1988; Harackiewicz, Barron, Carter, Letho, & Elliot, 1997). On the basis of the Fenollar et al. (2007) model, I hypothesized that performance-approach goals have a positive effect on rehearsal strategies and an indirect and positive effect on exam performance. In contrast to the findings of Fenollar et al. (2007), in this study performance-approach goal orientations do not predict whether students are more likely to use rehearsal strategies. Lack of a significant relationship between performance-approach goals and learning strategies has been reported by other researchers (Middleton & Midgley, 1997; Wolters, 2004). Wolters suggests that students' focus on doing better than others may have less to do with their choice of study strategies and more to do with other outcomes such as self-concept, self-consciousness, and test anxiety. Additional research is needed to clarify the inconsistencies in the findings of these studies.

Contrary to my expectations, in this study achievement goals do not predict performance on class assignments. Fenollar et al. (2007) found that achievement goals did not directly affect academic performance but rather mediated the effect on performance through choice of cognitive strategies and effort expended on course assignments. Fellonar et al. used a self-report measure of effort on course assignments, whereas I used behavioral measures of student engagement in this study. In this study, mastery, performance-approach, and performance-avoidance goals do

not predict homework, class participation, or quiz performance in this study. Student perceptions of effort most likely differ from behavioral measures of engagement. When indicating effort on self-report measures, students may be more susceptible to self-presentation biases or more likely to overestimate their actual effort. In the future, researchers should further examine how achievement goals relate to performance on course assignments.

Researchers have reported mixed results concerning the link between achievement goal orientations and test anxiety (Middleton & Midgley, 1997; Skaalvik, 1997). Middleton and Midgley reported that mastery goals were unrelated to test anxiety whereas performance goals were positively associated with test anxiety. In accordance with their findings, I predicted that students who adopt mastery goal orientations report less test anxiety than students who adopt performance goals. The results of this study, however, were similar to Skaalvik's finding that mastery goal orientation does not predict test anxiety. In addition, performance-approach goal orientation also does not predict self-reported anxiety in this study.

Middleton and Midgley (1997) and Skaalvik (1997) reported that performance-avoidance goals were positively related to test anxiety. Consistent with these studies, performance-avoidance goal orientations have a direct positive relationship on test anxiety in this study. In addition, performance-avoidance has a small indirect effect on exam performance through anxiety. These findings support a growing consensus in the research that students who seek to avoid being labeled as incompetent in relation to others tend to also report greater anxiety in testing situations than students who are less likely to hold performance-avoidance goals.

Interest

As predicted, interest has a direct positive effect on mastery goal orientation. Students who view the information in the course as useful, personally meaningful, and interesting are more likely to report a desire to gain a deeper and more thorough understanding of the material. The

results also show that interest has a direct negative effect on performance-avoidance goal orientation. That is, students with less interest in psychology are more likely to worry about their performance in the class. Interest does not predict performance-approach goal orientation in this study.

In addition to the relationships between interest and achievement goals, interest predicts elaboration in this study. That is, participants who indicate high interest in psychology are more likely to report making connections between course concepts and use deeper processing strategies. This finding corresponds to findings reported by Sorić and Palekčić (2009) that interest had an indirect effect on exam performance through learning strategies. Although the correlation between interest and rehearsal strategies was significant (r = .15; p = .03), interest does not predict rehearsal strategies in the model. Researchers need to further explore the links between interest and cognitive strategies.

In a survey of undergraduate students' perceptions of variables that motivate course attendance, Gump (2004) indicated that students were more likely to attend class if they found the instructor, the material, or both interesting. In contrast to Gump's findings, students in this study with higher interest in the course material are not more likely to attend class than those with less interest. Although Gump measured students' intention to attend class on the basis of interest, I measured the relationship between students' interest and actual attendance behaviors. However, in this study, the possibility of finding an effect of interest on attendance was limited by the students' strong interest in the course and high attendance rates. Most participants report high levels of interest in the course material (M = 35.95, SD = 4.10) where 42.00 is the highest possible score on the interest scale. Also, students are given points for attendance as part of their final grade in the course, although the weight of attendance points on the final grade is small

(5%). Mean attendance points for the study indicate that attendance is high overall (*M* = 60.01, *SD* = 10.91), with 69.6 points indicating perfect attendance in the course. In the future, researchers should examine the relationship between interest and attendance in academic areas of varying interest to students. In addition, researchers might examine how interest predicts attendance in the absence of an incentive for attendance. It seems plausible that when attendance is not rewarded by course policies that students with more intrinsic motivation (i.e., personal interest in the subject material) will be more likely to attend.

Self-Efficacy Beliefs

In accord with previous findings (Fenollar et al., 2007; Vrugt et al., 1997; Vrugt et al., 2002) and the achievement goal theory of Elliot et al. (1999), self-efficacy beliefs have a direct positive effect on mastery and performance-approach goals, and a direct negative effect on performance-avoid goals. That is, students high in perceived self-efficacy are likely to adopt mastery and performance-approach motivation goals than students low in perceived self-efficacy. In contrast, those low in perceived self-efficacy are more likely to adopt performance-avoid goals, that is, to seek ways to avoid revealing their low performance to self and others, than students high in perceived self-efficacy. These findings add support to a well established trend in the literature regarding self-efficacy beliefs and achievement goals.

I expected that perceived self-efficacy has a direct positive effect on elaboration strategies and a direct negative effect on rehearsal strategies. As hypothesized, self-efficacy beliefs predict elaboration. That is, students who are more likely to express higher confidence in their perceived ability to do well in the course report using elaborative strategies more often than students with lower perceived self-efficacy. Although perceived self-efficacy predicts rehearsal, the relationship is a direct positive relationship rather than the predicted negative relationship reported by Fenollar et al. (2007). Other researchers have reported positive relationships between

perceived self-efficacy and rehearsal strategies consistent with the findings in this study (see Bartels, Magun-Jackson, & Kemp, 2009). Bartels et al., (2009) reported that perceived self-efficacy significantly predicted both rehearsal ($\beta = .63$) and elaboration ($\beta = .31$) in their regression analysis. The findings in this study suggest that students high in perceived self-efficacy are likely to use both elaborative and rehearsal strategies. In the future, researchers should explore the inconsistencies in the literature regarding perceived self-efficacy and rehearsal cognitive strategies.

Test Anxiety

In addition to the effects of ability and motivation, I found that test anxiety plays a role in achievement. Consistent with prior research, test anxiety has a direct negative effect on exam performance (see Seipp, 1991; Zeidner, 1998). Students who report high levels of test anxiety tend to perform less well on exams compared to students with less anxiety. This finding lends support to a robust body of research relating test anxiety with exam performance (for a review, see Seipp, 1991; Zeidner, 1998).

Effectively measuring test anxiety continues to be an issue in the research, and I used only the cognitive components of test anxiety as predictors. Benson and El-Zahhar (1994) suggested that researchers measure participants' perceptions of biological effects of anxiety in addition to cognitive indicators. In the future researchers should examine the paths between motivational variables, biological indicators of anxiety, and exam performance to assess the impact of biological as well as cognitive components of anxiety.

Course Engagement

In this study, students' cognitive strategies and achievement on course assignments predict exam performance in the present study. I extended the model of Fenollar et al. (2007) by including more behavioral measures of student effort than the self-report measures Fenollar et al.

used. I included behavioral measures of attendance, homework, class participation, and performance on quizzes. In accordance with previous research (Gunn, 1993; Snell, et al., 1995), I found that attendance has a direct positive effect on course assignments and participation, and an indirect positive effect on exam performance. Homework predicts quiz scores and has an indirect effect on exam performance through quizzes. Course participation predicts homework, but does not predict quizzes or exams. Last, quizzes predict exam performance. In the following sections, I discuss the findings of this study regarding learning strategies, attendance, homework, and course participation in light of previous research and make suggestions for further study.

Learning Strategies

As predicted in this study, students who use more learning strategies requiring elaboration of concepts perform better on exams than students who use rehearsal strategies. Students who report using more elaborative strategies perform better on exams than those who scored lower on elaboration. These findings support earlier research that demonstrated elaborative learning strategies predict achievement (Fenollar et al., 2007; Greene & Miller, 1996; Nolen, 1988). In an extension of prior research, I found support for the link between elaborative learning strategies and achievement when including previously excluded predictors of exam performance in the model of Fenollar et al. This study adds additional validation to prior research showing that found deep processing strategies predict exam performance. In this study, rehearsal does not predict exam performance.

Attendance

I found that attendance does not directly predict exam performance but has an indirect effect on exam performance through course assignments (homework, course participation, and quizzes). In this study, attendance predicts homework accuracy, class participation, and quiz performance. Attendance has an indirect effect on exam performance through the following

paths: quiz; homework and quiz; class participation, homework, and quiz. These findings support previous findings that attendance predicts achievement (Gunn, 1993; Snell, et al., 1995). Students who attend class tend to do better on course assignments than those who attend less.

There were strengths and limitations regarding the measurement of attendance in this study. Using attendance data gathered by the instructor eliminated the limitations encountered by Hardy et al. (2003) when they used self-reported attendance data. However, attendance is undoubtedly influenced by the course structure in this study. As noted previously, students receive credit for attending classes toward their overall course grade resulting in a high average class attendance (M = 60.01, SD = 10.91, where 69.60 points indicate perfect attendance). In the future, researchers should examine the relationship between attendance and achievement in courses that do not have attendance policies that may counteract students' natural attendance patterns.

Homework

On the basis of previous research (Cooper, 1989; Cooper, et al., 2006; Paschal, et al., 1984; Trautwein, 2007), I predicted that students who do well on homework assignments also perform well on exams. Although homework does not directly predict exam performance, it does have a significant indirect effect on exam through quiz performance. Homework has a direct positive effect on quiz performance.

In this study, homework is comprised of open-ended questions that students respond to in a written paragraph. The structure of the courses also influences the relationships between assignments in this study. Clearly, different types of homework assignments may influence the relationship between homework and exam performance. For instance, reading assignments assigned as homework may relate to achievement differently than graded, written assignments.

In the future, researchers should explore how different types of homework predict exam performance.

Course Participation

Similar to the findings regarding homework and exam performance, I found that course participation does not directly predict exam performance but has a significant, indirect effect on exam performance through homework and quizzes. Unlike previous researchers who relied on self-report measures of course participation (see Hardy et al., 2003; Handelsman et al., 2005), I used more behavioral measures of student involvement. Specifically, these results are consistent with the findings of Hardy et al. (2003). Other researchers, however, have reported a direct link between course participation and exam performance (see Hill, 1990). The inconsistencies in the findings may be due to the various ways that researchers operationalize student participation. Further research is needed to examine the inconsistencies in the findings regarding course participation and achievement.

Quizzes

Consistent with previous research that scores on announced quizzes predict exam performance (Geiger & Bostow, 1976; Noll, 1939), I found that quiz performance has a direct positive effect on exam performance. Significant predictors of quiz performance include homework, prior knowledge, and attendance. Azorlosa and Renner (2006) reported that announced quizzes had no effect on exam performance in their study. However, one of the limitations in their research was a mismatch between quiz type (multiple choice) and exam type (essay). In this study, quizzes and exams consist of multiple choice responses, and the results suggest that when quiz and exam types are consistent, quizzes more accurately predict exam performance than when they are not.

Limitations of the Study

The results of this study have the potential to provide information that could be useful in improving educational practice in community college psychology courses. It is important to note, however, that limitations of the study may have reduced the significance of the study. First, the results of the study may have limited generalizability. Researchers have found evidence that variables related to learning in higher education may be discipline specific (see Donald, 1995). Variables that may predict students' success in psychology courses, for example, may differ from those that predict success in organic chemistry classes. Also, variables related to success in community college courses that focus on acquisition of basic knowledge may differ from those that predict success in upper-level university courses where students are required to critically analyze theories or create new knowledge in a discipline. Therefore, variables that predict learning in community college psychology courses may not predict learning in higher-level university psychology courses. Last, students who choose to attend community colleges tend to differ from students who enroll in universities in terms of academic preparedness, educational goals, age, and socioeconomic status (Grimes & David, 1999). Therefore, variables that predict learning for community college students may not relate to learning in university students.

The use of self-report measures of intelligence beliefs, interest, achievement goal orientations, self-efficacy, test anxiety, and learning strategies may have also limited the validity of the results of the study (see Hersen, 2004). Participants' responses may have been biased when responding to self-report measures including experimenter expectations, social-desirability and self-presentation biases. In addition, leaving out a measure of general academic ability (e.g., Verbal GRE or ACT scores) and personality characteristics such as conscientiousness, locus of control and work avoidance may have affected the results. These characteristics should be included in future studies. Also, I was the only instructor in the study which may have introduced

experimenter biases and effects due to having only one instructor. Last, the results of the study are based on correlational data and interventions are needed to validate cause-and-effect relationships suggested in the results of the test of the model.

Implications for Theory and Practice

Using a social cognitive framework, I found several cognitive, motivational, and class engagement variables predict academic achievement. First, the results of this study support Bandura's (1986) concept of perceived self-efficacy. Specifically, perceived self-efficacy predicts achievement goals and cognitive strategies in the study. Although self-efficacy beliefs do not predict exam performance directly, they predict choices students make regarding achievement goals and approaches to learning. In addition, findings regarding anxiety and exam performance are replicated in this study; participants with higher levels of anxiety tend to perform worse on exams. Current practices that require remediation for students with reading comprehension difficulties seem justified by the findings that show college entrance reading ability predict exam performance and reading-dependent homework assignments. I also found support for prior claims that elaborative cognitive strategies predict exam performance. Last, I found some support for theories regarding the impact of course assignments on exam performance. Homework, attendance, and class participation have indirect positive effects on exam performance, and quizzes have a direct positive effect on exam performance.

In contrast, I find no support for Dweck's (1986) conception of the relationship between students' implicit theories of intelligence theory, their achievement goals, learning strategies, and academic achievement. The findings of this study do not support Elliot's et al. (1999) relationship between mastery and performance-approach goals with cognitive strategies. However, performance-avoid goals predict the use of rehearsal strategies.

Practically, those interested in making the link between theory and practice may be tempted to make suggestions for application. However, suggesting causal links between the variables would be premature. The results of structural equation models are based on correlational data. Experimental research would be necessary to verify cause and effect relationships.

Conclusions

The social cognitive model of student learning tested in this study provides information regarding student characteristics that may influence student learning in community college psychology courses. Those interested in understanding these characteristics and increasing the likelihood that students learn should examine the relationships among students' ability, test anxiety, motivation, engagement, and their academic performance. This study offers groundwork for researchers to conduct experimental studies to further verify causal links among the variables. For instance, the findings of this study reveal the need to explore strategies for increasing students' interest in course material to determine if students are more likely to adopt mastery goals and use more elaborative strategies when students' interest is increased. Also, attendance is a significant predictor of performance on course assignments. Studies that contrast performance of students in courses with attendance policies against those in courses with no such policies would provide needed information regarding the causal links between attendance and achievement. Similarly, experimental treatments to reduce anxiety and increase reading ability as they relate to exam performance would help instructors and administrators make informed decisions regarding policies aimed at improving student learning.

In addition to encouraging new lines of experimental research, replication studies are needed to determine if the variables that predict student achievement in this study also predict achievement in other courses and other educational institutions. For instance, researchers should

conduct similar research in other academic disciplines such as mathematics, natural sciences, and communications to investigate the role of ability, motivation, test anxiety, and engagement in achievement. Similarly, researchers should examine how students' individual differences influence achievement in upper division courses where students are often less concerned with gaining foundational knowledge and more concerned with construction of knowledge. Furthermore, replication of this study in different cultures would help determine if the reported relationships are characteristic of college students around the world. I am optimistic that with additional research a clearer understanding of the modifiable influences on student learning will emerge that will improve educational practice in higher education.

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BIOGRAPHICAL SKETCH

Michael E. Barber was born in Sarasota, Florida and raised in northeast Florida. He received a bachelor's degree in psychology from the University of North Texas. Returning to Florida, he completed a master's degree in psychology from the University of North Florida. While working toward a doctoral degree in educational leadership at the University of North Florida, Michael took an educational psychology course and subsequently decided to pursue a Ph.D. in educational psychology at the University of Florida. Michael holds a position as an Associate Professor of Psychology at Santa Fe College in Gainesville.