Academic performance in college online courses: the role of self-regulated learning, motivation and academic self-efficacy

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ACADEMIC PERFORMANCE IN COLLEGE ONLINE COURSES:
THE ROLE OF SELF-REGULATED LEARNING, MOTIVATION
AND ACADEMIC SELF-EFFICACY

by

Catherine L. Basila

A Dissertation
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Doctor of Philosophy

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Academic Performance in College Online Courses:
The Role of Self-Regulated Learning, Motivation and Academic Self-Efficacy

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Catherine L. Basila

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Abstract

Student academic performance in college online courses was examined in relation to self-regulated learning, motivation and academic self-efficacy. The Motivated Strategies for Learning Questionnaire (Pintrich, Smith, Garcia & McKeachie, 1991) was used to identify participants’ self-regulated learning, motivation and academic self-efficacy. Both correlational and hierarchical multiple regression analyses were used to identify the relationships between and among students’ academic performance, self-regulated learning, motivation and academic self-efficacy while prior online experience, degree requirement of courses, and instructor feedback were held constant. Results of the correlation analysis indicate that self-regulated learning, motivation and academic self-efficacy are positively related to students’ performance in their online courses. Results of the hierarchical multiple regression indicate that self-regulated learning, motivation and academic self-efficacy account for 43% of the variance in students’ grades, with academic self-efficacy playing the most important role in accounting for variations in students’ success in their online courses. In addition, when the linear effects of all major student related factors were considered in the regression analysis, the relationships between students’ academic performance and motivation, and self-regulated learning changed. Motivation became negatively related to students’ performance and self-regulated learning was no longer found to have a significant relationship with students’ performance. Overall, results suggest that self-regulated learning, motivation and academic self-efficacy are related to students’ academic performance in their online courses. However, when self-regulated learning, motivation and academic self-efficacy are considered together, self-regulated learning becomes unimportant for good academic performance and high motivation becomes negatively related to students’ success in their online courses.
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The culmination of my dissertation research stirs a great deal of emotion, fulfillment and excitement. While many challenges were faced throughout this process and many tasks seemed insurmountable, the undying support and encouragement that I received from so many people helped me to persevere and move forward with confidence. I have such heart-felt gratitude for the many people who have contributed in so many ways to the completion of this research and this process. I would like to extend my deepest appreciation to each and every one of them.

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APPENDIX

Questionnaire: Modified Motivated Strategies for Learning (Pintrich et al., 1991) and instructor feedback.
Chapter 1: Introduction

An overview of the current study will be provided in terms of (1) the focus of this study, (2) why this study was proposed, and (3) how this study was conducted.

Focus of This Study

Multiple factors influence college students’ academic performance. These factors fall within three major categories: student-related factors, teacher-related factors, and context-related factors. Context-related factors could include the students’ learning environment, such as the traditional face-to-face classroom environment or the online learning environment. Student-related factors could include self-regulatory behavior, motivation, effort level, self-efficacy, students’ prior experience, academic preparation, academic skills, personality characteristics and pre-existing factors such as family and socio-economic status. Teacher-related factors could include curriculum goals, quality of teaching, pedagogical practices, the type of feedback given to students, and the like. This study focused on how student-related factors play a role in students’ online learning by examining (1) academic performance as an outcome variable, (2) self-regulated learning, motivation and academic self-efficacy as explanatory variables, and (3) prior online experience, instructor feedback and degree requirement of courses as control variables.

Why This Study Was Proposed

Many constructs could be investigated when evaluating which factors influence student academic performance in the online learning environment. However, both the compelling empirical research in the traditional classroom environment and the lack of current research in the online environment have motivated me to explore the constructs of self-regulated learning, motivation and academic self-efficacy. Although decades of research in the traditional
classroom environment has revealed that student academic performance is significantly influenced by and related to self-regulated learning (Garcia & Pintrich, 1996; Pintrich, 1999; Pintrich & De Groot, 1990 &), motivation (Clark, Middleton, Nguyen & Zwick, 2014; Schunk, Meece & Pintrich, 2014; Schunk & Zimmerman, 2008), and self-efficacy (Linnenbrink & Pintrich, 2002; Pajares, 1996; Pintrich & De Groot, 1990; Schunk, Meece & Pintrich, 2014), little research exists on the role of these constructs in the online environment. In general, much is unknown about the role of academic self-efficacy, motivation and self-regulated learning in the online classroom. Therefore, empirical research is needed to explore the role of these constructs in the online classroom.

This section will focus on why this study was conducted and how student-related factors play a role in students’ online learning in terms of (1) academic performance as an outcome variable, (2) student-related factors as explanatory variables (self-regulated learning, motivation and academic self-efficacy) and control variables (prior online experience and degree requirement of course), and (3) a teacher-related factor (instructor feedback) as a control variable.

**Academic performance.** Online education is in great demand and is found to be a highly effective learning environment (Shachar & Neumann, 2003). Since online education has grown exponentially since 1990 (Moore, 2013) and over 4 million students in higher education were enrolled in at least one online course in 2010 (Allen & Seaman, 2010), it is of utmost importance to explore and understand the role of context-related factors, such as the online learning environment, on college students’ academic performance. Although the effectiveness of online learning has been scrutinized (Allen & Seaman, 2010), with the face-to-face learning environment being viewed as the superior modality, extensive research has demonstrated that
online students often outperform (Shachar & Neumann, 2003) or on average are modestly better than students in face-to-face instruction (Means, Toyama, Murphy, Bakia & Jones, 2010). Based upon this evidence, online learning has been established as an effective learning environment. Overall, research demonstrates that students’ learning environments and their experiences within these environments impact their academic performance in many different ways (Kuh, Kinzie, Buckley, Bridges & Hayek, 2006; Moore, 2013).

Students’ academic success and performance is defined as “academic achievement, engagement in educationally purposeful activities, satisfaction, acquisition of desired knowledge, skills and competencies, persistence, attainment of educational objectives and postcollege performance” (Kuh, Kinzie, Buckley, Bridges & Hayek, 2006, p. 7) and is most commonly measured using students’ grades and GPA (Kuh et al., 2006), as it is in this study. Numerous factors have been found to contribute significantly to students’ academic performance. In addition to the context-related factors discussed above, student-related factors and teacher-related factors also play a major role in students’ overall academic achievement.

**Student-related factors.** Multiple student-related factors can contribute to a student’s overall academic performance. Some of these factors may include a student’s prior experience, pre-existing factors (e.g. family, cultural, social and political) (Kuh et al., 2006), academic preparation (Adelman, 2004; Kuh et al., 2005; Pascarella & Terenzini, 1991), academic skills, personality characteristics (Kuh, et al., 2005), effort level, (Pintrich & Schrauben, 1992; Schunk & Pajares;) motivation (Adelman, 2004; Kuh et al., 2005; Pascarella & Terenzini, 1991), self-regulatory behavior, self-efficacy, (Garcia & Pintrich, 1995; Pintrich & De Groot, 1990) and previous online learning experience (Richardson & Newbury, 2006) for those enrolled in online courses. Overall, research indicates that students who perform well academically are more likely
to have certain personality characteristics (Schniederjans & Kim, 2005), good academic skills and effort level (Kerr, Rynearson & Kerr, 2006), rigorous academic preparation (Kuh, 2007), high self-efficacy and self-regulatory behavior (Garcia & Pintrich, 1995; Pintrich & De Groot, 1990) as well as high motivation (Kuh et al, 2005; Pascarella & Terenzini, 1991).

Self-regulated learning, motivation and academic self-efficacy will be discussed as major student-related factors that have been identified in the literature as playing both an important and critical role on student academic performance (Adelman, 2004; Garcia & Pintrich, 1995; Kuh et al., 2005; Pascarella & Terenzini, 1991; Pintrich & De Groot, 1990). In addition, the control variables of prior online learning experience and degree requirements of courses will be discussed as minor student-related factors.

**Self-regulated learning.** Self-regulated learning has been found to play an important role on student performance in both the traditional and online learning environment. In fact, research demonstrates that students who engage in self-regulated learning behavior learn better because they set goals for themselves, use effective learning strategies and monitor and assess their own progress (Zimmerman & Schunk, 2001). In the online learning environment self-regulated learning has been found to be a critical success factor for students (Artino, 2008; Barnared, La, To, Paton & Lai, 2009). Although the research literature exploring the role of self-regulated learning in the online classroom is limited, the findings consistently demonstrate moderate to strong relationships and predictive ability of self-regulated learning on students’ performance, self-efficacy, motivation (Artino, 2007 & Shen & Cho, 2013), study habits and discourse (Shea et al., 2013). Overall, self-regulated learning in the online learning environment is not fully understood.
Motivation. Motivation has also been found to play an important role on students’ academic performance in both the traditional and online learning environment. In the online learning environment specifically, motivation has been identified as a critical factor of student success (Sankaran & Bui, 2001; Shih & Camon, 2001). Although limited research exists on the role of motivation in the online environment, evidence consistently demonstrates that motivation plays a significant role on student performance (Durron, Dutton, & Perry, 2002) in all learning environments. Most of the online research focuses on motivation as a personal characteristic that remains reasonably stable across different situations and contexts (Hartnett, S. George & Dron, 2011), not considering that individual motivation may vary in different ways in different contexts (Turner & Patrick, 2008). Moreover, research in the online environment that views motivation as dynamic and contextually bound is lacking.

Academic self-efficacy. Academic self-efficacy also contributes greatly to student success and performance in both the traditional and online classroom environments. In fact, academic self-efficacy has been identified as an important factor and key component to academic success in the online learning environment (Hodges, 2008). The research literature however is limited and inconsistent with most of the research focusing on general internet self-efficacy, the interplay between learners’ academic self-efficacy and internet-based learning and internet based learning self-efficacy (Tsai, Chuang, Liang & Tsai, 2011). Very little online research focuses on academic self-efficacy.

Prior online learning experience. Students’ prior online learning experience has been identified in the research literature as a contributor to students’ performance in the online learning environment (Hattie & Gan, 2011). Research reveals that students who have prior online learning experience will be more responsible for their learning, use more self-regulatory
behaviors (Richardson & Newbury, 2006) and be more familiar with the technological aspects of the virtual classroom, thus more readily taking advantage of the opportunities that exist in this environment (Osborn, 2001). Because prior online experience has been found to contribute to students’ performance, it is important to control for it in this study.

Degree requirements of courses. Students’ perception of the value of a course and thus their performance in that course can be influenced by whether the course is degree required or not. According to Coleman & Fararo (1992), students may feel that there is a greater “payoff” when taking a degree required course as opposed to an elective course and as a result they are more likely to persist in that course. Given that students’ perception of and performance in a course can be influenced by whether the course is required or not, it is important to control for it in this study.

Teacher-related factors. Various teacher-related factors that can influence college students’ academic performance include curriculum goals, availability, quality of teaching, pedagogical practices and the type of feedback given to students.

Instructor feedback. Compelling evidence suggesting that teacher feedback has a powerful influence on students’ performance (Hattie & Gan, 2011) and is among one of the top ten influences on student achievement (Hatti & Timperley, 2007). Although research reveals that teacher feedback is powerful, different studies report incongruent findings regarding feedback variables (Shute, 2008). Since teacher feedback has been found to be such a powerful influence on students’ performance (Hattie & Gan, 2007) it is necessary to control for it in this study, especially since teacher feedback is more readily used in the online classroom as compared to the traditional classroom due to the nature of its environment.
Significance of this study. Overall, this study made important contributions to the field of online research. First it added to the limited research that exists in this area of online education and provides valuable information about the role of academic self-efficacy, motivation and self-regulated learning on student performance in online courses. Second, it helped to fill the gap that exists in the research between what we know about the importance and role of academic self-efficacy, motivation and self-regulated learning in the traditional classroom and the limited knowledge and information we have about academic self-efficacy, motivation and self-regulated learning in the online classroom. Third, the knowledge gained from this study provides online college teachers with valuable information and knowledge regarding the role of academic self-efficacy. This information and knowledge is valuable and useful because it provides online teachers with information that could assist them in designing more effective online courses. According to Artino & Ioannou, (2008), there are many instructional implications for online teachers related to this type of knowledge, including: assessing components of students’ self-regulated learning in order to supply individual feedback and support; creating an environment that will develop and support students’ self-efficacy; creating task relevance that is grounded in authentic problems to generate student interest; enhancing teaching presence; and promoting and engaging in social modeling.

Currently, there is a limited amount of research which specifically has investigated the role of self-regulated learning, motivation and academic self-efficacy on academic performance in the college online learning environment. Therefore, there is a need to understand the role of these constructs in order to optimize student learning and performance, especially since online education is becoming increasingly more prominent in secondary education.

How This Study Was Conducted
An overview of how this current study was conducted will be presented in terms of the theoretical framework, research questions, methodology, and definitions of variables.

**Theoretical framework.** Using Pintrich’s social-cognitive view of self-regulated learning as a theoretical framework, this study explored the role of self-regulation, motivation and academic self-efficacy on academic performance among online college students. This general conceptual model was an ideal framework to utilize because it provides an inclusive perspective on student learning. It incorporates cognitive, motivational (including self-efficacy) and social contextual factors and emphasizes the importance of self-regulatory activities on learners’ achievements as well as their mediating role on the relations between learners and their environments (Pintrich, 2000).

The assumptions of the social cognitive framework of self-regulated learning include the following. The first assumption (active, constructive assumption) views learners as active participants in the learning process, which means that they construct their own meanings, goals and strategies. The second assumption (potential for control assumption) assumes that students have the ability to monitor, control and regulate different aspects of their motivation, cognition and behavior. The third assumption (goal, criterion or standard assumption) “assumes that there is some type of goal, criterion or standard against which comparisons are made in order to assess whether the learning process should continue as is or if some type of change is necessary” (p. 387). The last assumption is that “self-regulatory activities are mediators between personal and contextual characteristics and actual achievement or performance” (p. 387).

Additionally, the self-regulatory model includes four phases of self-regulation: (1) forethought, planning, activation; (2) monitoring; (3) control, and (4) reaction and reflection, which depending upon the learning situation may or may not be engaged in (Schunk, 2005). For
each phase of this model, motivational processes subject to self-regulation are considered. In fact, motivation and self-efficacy are key components to Pintrich’s self-regulation framework. This emphasis on motivation is a contrast to other models of self-regulation since they tend to emphasize cognitive and behavioral factors as opposed to motivational factors (Zimmerman & Schunk, 2001).

**Research questions.** The following research questions regarding the role of self-regulated learning, academic self-efficacy and motivation on students’ performance in college online courses were addressed in this study.

**Research question 1.** What is the main effect of self-regulated learning, motivation and academic self-efficacy on academic performance in college online courses?

**Research question 2.** What are the interaction effects of self-regulated learning and motivation; self-regulated learning and academic self-efficacy and motivation and self-efficacy on student academic performance in college online courses?

**Research question 3.** What is the interaction effect of self-regulated learning, motivation and academic self-efficacy on academic performance in college online courses?

**Methodology.** To address the three research questions in this study a modified one-group post-test only design was used. Participants included 127 community college students from SUNY Adirondack who completed a 60 item questionnaire at the end the college semester. Upon completion of the data collection, a hierarchical multiple regression was used to determine whether self-regulated learning, motivation and academic self-efficacy account for students’ performance in college online courses.

**Definitions of Variables**
Variables specified in the above three research questions are further defined here. The extensive body of research in the traditional face-to-face classroom indicates that motivation (Pintrich, 2003) and self-efficacy (Pintrich & De Groot, 1990) play an important role in students’ academic success and performance and that students’ level of self-regulation is linked to differences in academic achievement (Zimmerman & Schunk, 2008). These variable were chosen to identify whether they influence students’ academic performance in the online classroom in the same manner.

**Academic performance.** Students’ college grades and GPA are traditional measures commonly used to determine academic achievement (Kuh, et al., 2006). In this study, academic performance will be operationally defined as students’ GPA at the end of the college academic semester.

**Motivation.** Motivation will be operationally defined as the reasons students engage in academic tasks based on value beliefs: intrinsic goal orientation, extrinsic goal orientation and task value. This definition is based on Pintrich’s (1989) motivational construct of value. This construct focuses on the reasons students engage in academic tasks (their value beliefs) and includes three subcategories: intrinsic goal orientation (focuses on learning and mastery), extrinsic goal orientation (focuses on grades and approval) and task value beliefs (judgments of how useful, important and interesting the course content is to students) (Duncan & McKeachie, 2005).

**Self-regulated learning.** Self-regulated learning will be operationally defined in this study as “an active, constructive process whereby learners set goals for their learning and the attempt to monitor, regulate and control their cognition, motivation and behavior, guided and
constrained by their goals and the contextual features in the environment” (Pintrich, 2000, p. 453).

**Academic self-efficacy.** Self-efficacy will be operationally defined as students’ judgments about their ability to accomplish a task as well as their confidence in their skills to perform that task (Pintrich, Smith, Garcia & McKeachie, 1991) in the college online classroom.

**Prior online experience.** Students’ prior online experience will be operationally defined as the number of online courses a student has taken prior the current course they are enrolled in.

**Degree requirement.** Degree requirement will be operationally defined as whether a course is required for a students’ program of study or not.

**Instructor feedback.** Instructor feedback will be operationally defined as the communication of information to students that is intended to modify his or her thinking or behavior to improve learning (Shute, 2008).
Chapter 2: Literature Review

The purpose of this review will be discussed along with a definition of online learning, gender ratio in online courses, and an overview of Pintrich’s social cognitive view of self-regulated learning, which is the theoretical framework driving this study. This overview will be followed by a review of the current research literature on (1) academic performance (outcome variable), (2) three major student-related factors: self-regulated learning, motivation and academic self-efficacy (explanatory variables), and (3) three minor student and teacher-related factors: prior online experience, degree requirements of courses, and instructor feedback (control variables). Additionally, the gap in the research literature will be discussed.

The purpose of this review is to provide an extensive overview of the current literature on student academic performance, self-regulated learning, motivation and academic self-efficacy, using Pintrich’s social cognitive view of self-regulated learning as a guide. Although the primary focus of this review is to establish the role of these constructs in the online learning environment, a brief overview of these constructs in the traditional classroom environment will also be discussed. Given that research in the area of online education is still emerging, there is only a limited amount of research in each of these areas. Ultimately, the role of self-regulated learning, motivation and academic self-efficacy on student performance in the online learning environment is not fully understood. This review will provide a baseline of knowledge on the role of these constructs in the online learning environment, which in turn will assist in establishing a foundation of knowledge that can be built upon with this research and with future research.

Online Learning and Gender Ratio in Online Courses
**Definition of online learning.** Online learning is an offspring of distance education (Moore, 2013), which is defined as “teaching and planned learning in which teaching normally occurs in a different place from learning, requiring communication through technologies as well as special institutional organizations” (Moore & Kearsley, 2011, p. 2). According to Allen & Seaman (2014), an online course by definition consists of 80 percent of the course content being delivered online, whereas traditional and web facilitated face-to-face instruction is defined by at least 71 percent of the course content being delivered in the classroom with less that 29 percent delivered online. Furthermore, blended (or hybrid) instruction is defined by 30 to 80 percent of the course content being delivered online and the remainder in the classroom.

**Sex ratio in online courses.** While online learning appeals to both males and females, females constitute a greater share of enrollments in online courses (Secreto, 2013). A number of studies have reported 2 to 9 times as many females enrolled in online courses than males (Artino & Jones, 2012; Barnard-Brak, Lan, & Paton, 2010; Bell & Akroyd, 2006; Cho & Shen, 2013; Jost, Rude-Parkins & Githens, 2012; Puzziferro, 2008; Radovan, 2011; Sanson, Smith, Thonan & MacNamara, 2012; Secreto, 2013; Stewart, Bachman & Johnson, 2010), with most studies noting that females make up 70 to 80 percent of the enrollments (Artino & Jones, 2012; Bell & Akroyd, 2006; Jost, Rude-Parkins & Githens, 2012; Puzziferro, 2008; Radovan, 2011; Sanson, Smith, Thonan & MacNamara, 2012; Secreto, 2013; Stewart, Bachman & Johnson, 2010). While evidence indicates that females are more likely to enroll in online courses, the link between sex and student performance is unclear (Amro, Mundy & Kupczynski, 2015). Furthermore, online learning’s unique sex ratio limits the extent to which we can extend the finding of classroom research to the online environment.

**Theoretical Framework**
“The field of research on college and university student motivation and learning is quite diverse and there are many different models and perspectives” (Pintrich, 2004, p. 385).

Pintrich’s social cognitive view of self-regulated learning is an inclusive perspective on student learning which incorporates cognitive, motivational (including self-efficacy) and social contextual factors and emphasizes the importance of self-regulatory activities on learners’ achievements as well as their mediating role on the relations between learners and their environments (Pintrich, 2000). This framework also offers “a broad outline of the different types of self-regulatory strategies that college students might use to control their own cognition, motivation, affect and behavior, as well as the college context” (Pintrich, 2004, p. 400). In addition, several scholars have found that the social cognitive view of self-regulation is very useful in analyzing and explaining student performance in the online classroom (Artino, 2007; Hodges, 200) and has been used by researchers as a means of better understanding how students who are successful adapt their beliefs and their behaviors to improve their learning in the online classroom environment (Artino & Stephens, 2009). Since the focus of this study is on the student related factors of self-regulation, motivation and academic self-efficacy among online college students, this general conceptual model is an ideal framework to utilize because it can explain students’ use of these cognitive, motivational and social contextual factors to regulate their own behaviors in the online learning environment.

Due to the student-centered nature of the online learning environment, students must be more active, goal oriented, self-regulatory and able to monitor and control cognition, motivation and behavior in this environment. According to Pintrich’s social cognitive framework of self-regulated learning, all of these components play an important role in students’ academic performance. In addition, this framework is based on four general assumptions (Pintrich, 2004):
First, the active, constructive assumption views learners as active participants in the learning process. Based on this assumption, learners construct their own meaning, goals and strategies from information in the environment as well as their own mind (Pintrich, 2004). Pintrich (2000) indicates that this is the most important assumption of this framework.

Second, the potential for control assumption, assumes that students have the ability to monitor, control and regulate different aspects of their motivation, cognition and behavior recognizing that biological, developmental contextual and individual constraints can impede or interfere with students efforts at self-regulation (Pintrich, 2004). Third, the goal, criterion or standard assumption, “assumes that there is some type of goal, criterion or standard against which comparisons are made in order to assess whether the learning process should continue as is or if some type of change is necessary” (p. 387). In other words, this assumption assumes that students can set goals to strive for in their learning, monitor their progress towards those goals and adapt and regulate their motivation, cognition and to obtain those goals. The last assumption is that self-regulation of cognition, motivation and behavior are mediators between personal/contextual characteristics and achievement (Pintrich, 2004).

In addition to the major assumptions of Pintrich’s social cognitive framework, the self-regulatory model includes four phases of self-regulation (Pintrich, 2004): (1) forethought, planning, activation, which involves planning and goal setting in addition to activation of knowledge in a planful way, (2) monitoring, which includes attention and awareness of one’s own actions and their outcomes, (3) control, which includes the learners effort to control their own cognitions, motivation, behavior and contextual factors based on their monitoring with their goal being to enhance their learning, and (4) reaction and reflection, which includes the learners’ reactions and reflections that include judgments, attributions and self-evaluations of performance.
(Pintrich, 2004), which depending upon the learning situation may or may not be engaged in (Schunk, 2005). For each of the four phase of Pintrich’s model of self-regulated learning, the importance of motivational processes is stressed (Pintrich, 2000) with motivation and self-efficacy being key components to Pintrich’s self-regulation framework (Schunk, 2005). This emphasis on motivation is in contrast to other models of self-regulation since they tend to emphasize cognitive and behavioral factors as opposed to motivational factors (Zimmerman & Schunk, 2001).

For the many reasons mentioned above, Pintrich’s social cognitive view of self-regulated learning is ideal to use as the driving force of this research because this model provides the most comprehensive framework that will best explain the role of self-regulated learning, motivation and academic self-efficacy in the online learning environment.

**Academic Performance**

An overview of academic performance will be provided which will include a definition of academic performance and its’ measures. In addition, the typology of factors that contribute to academic performance in the online classroom, and the barriers that exist for these students will be discussed.

**Defining student academic performance.** Various pre-existing factors can influence students’ academic performance and success. According to Kuh (2007) “the trajectory for academic success in college is established long before students matriculate” (p. 95). Both Swail (2003) and Kuh, Kinzie, Buckley, Bridges & Hayek, (2006) take a longitudinal view regarding student success, in that they recognize that students begin their postsecondary education with many years of complex experiences and interactions that may influence their success in college.
Kuh et al, (2006) discusses the role of family, cultural, social, political and educational environments which may lead to some students being better prepared academically.

Additionally, Kuh (2007) asserts that there is no substitute for a rigorous academic preparation in elementary and high school. If students do not perform well in core high school courses, such as English and Math, interventions in college will have only small effects on their chances of being successful and completing their degree. “In addition to academic preparation, family and community support are indispensable to students in raising educational aspirations, becoming college-prepared and persisting” (Kuh 2007, p. 97). Although academic success in college is influenced by preexisting capabilities, these abilities may not differentiate between students who are high-achieving versus low achieving (Zimmerman & Schunk, 2008). Overall, students are likely to achieve higher levels if they choose to expend effort, engage in a task and persist (Pintrich & Schrauben, 1992; Schunk & Pajares 2009). Academic preparation and motivation are the best predictors of whether a student will graduate or not (Pascarella & Terenzini, 1991, Adelman, 2004; Kuh et al., 2005).

According to Kuh et al. (2006), a broad, holistic definition of student success must encompass the many indicators of this success. Based on this view, student success is defined as “academic achievement, engagement in educationally purposeful activities, satisfaction, acquisition of desired knowledge, skill and competencies, persistence, attainment of educational objectives and postcollege performance” (Kuh et al., 2006, p. 7).

**Measures of academic performance.** According to Venezia, Callahan, Finney, Kirst & Usdan (2005), some of the more common elements that measure student success, include quantifiable student attainment indicators such as grades, graduation, how long it takes to complete a degree and persistence to the sophomore year. More traditional measures of
academic achievement are also utilized to define student success as well. According to Kuh, Kinzie, Buckley, Bridges & Hayek (2006) some of those traditional measures include college grades, scores on traditional standardized college entry exams and credit hours accumulated in consecutive terms. GPA and students’ grades are the most common measures of student academic achievement and are influenced by the activities, interactions and persistence of the student. According to Kuh (2006), students’ grades and GPA are associated with the amount of time spent preparing for class, being prepared for class, asking question in class, maintaining good relationships with faculty, receiving prompt feedback from faculty, tutoring other students and having a positive evaluation of overall college experience. Pascarella & Terenzini (2005) indicate that the amount of effort a student exerts, their engagement in educational practices and the amount of time spent studying have a strong, significant effect on students’ overall academic development.

Although widely used in the academic world, the meaning of grades can be muddied due to variations in the method of calculation and the standards applied across academic departments and institutions (Pascarella & Terenzini, 2005). Despite these limitations, “virtually without exception, students’ grades make statistically significant, frequently substantial, and indeed often the largest contribution to student persistence and attainment. These finding hold true in the presence of a wide range of measures of students’ precollege academic and sociodemographic backgrounds as well as college experiences” (Pascarella & Terenzini, 2005, p. 397).

**Typology of Factors Contributing to Academic performance in Online Courses**

**Success in online courses.** Students who are successful in online courses tend to possess certain personality characteristics (Schniederjans & Kim, 2005), academic skills, and motivation levels (Kerr, Rynearson & Kerr, 2006). Specifically, empirical evidence has found
that four of the Big Five personality characteristics, conscientiousness, openness to experience, emotional stability and agreeableness are significant predictors of grade performance in totally web-based classes (Schniederjans & Kim, 2005). Reading and writing skills, independent learning, motivation and computer literacy, have also been identified by Kerr, Rynearson & Kerr (2006) as important factors for predicting and understanding student success in online courses. In addition, students who are successful engage in greater online activity, are intellectually inquisitive and have a good internal locus of control, all of which are predictive of final grades (Wang & Newlin, 2000). Furthermore, higher performing students with higher cumulative GPAs, do better in online courses than lower performing students who have lower cumulative GPAs (Jost, Rude-Parkins & Githens, 2012).

**Barriers contributing to lack of success.** Multiple barriers impede student success in online learning environments such as 1) lack of certain personality characteristics, like those mentioned above (Schniederjans & Kim, 2005), 2) course related factors, such as lack of social presence, structure of the course, time and support for studies and the possible boring, irrelevant nature of an online course, 3) technical difficulties, including both system-based and user based, and 4) lack of motivation (Moore, Sener, & Fetzner, 2009). Research evidence suggests that independent of prior skills, students may experience difficulties in online courses related to increased social distance, lack of structure inherent in online courses and technical difficulties (Moore, 2013).

Evidence suggests that lack of social interaction is the most important barrier for online students as well as administrative/instructor issues, time and support for studies and motivation (Moore, Sener, & Fetzner, 2009). Lack of social presence, of both the teacher and other students, has been found to negatively impact students’ motivation and inspiration to succeed in
an online course (Moore, 2013). In fact, learners “can be demotivated by online courses that are impersonal, irrelevant, boring, one-size-fits-all page turners” (Moore, Sener, & Fetzner, 2009). Furthermore, lack of structure in online courses may lead students to procrastinate, get lost or fall behind on assignments and in turn not do well in their courses (Moore, 2013). Lastly, technical difficulties can also act as barriers to students’ success, whether they be unavoidable system-based problems or difficulties caused by the user’s lack of familiarity with the system (Moore, 2013).

Role of Major Student-Related Factors

Self-regulated learning, motivation and academic self-efficacy will be discussed as major student-related factors that play a role in students’ academic performance in the online classroom. Although the major focus of this review will be the online classroom environment, research on self-regulation, motivation and academic self-efficacy in the traditional classroom will be discussed. This section will provide an overview of self-regulated learning, motivation and academic self-efficacy in terms of: (1) simple relationships between students’ academic performance, and self-regulated learning, motivation, and academic self-efficacy, (2) interactive relationships between and among online students’ academic performance, self-regulated learning, motivation, and academic self-efficacy, (3) quantity and focus of the research literature, and (4) strength and consistency of the research literature.

Simple relationships between online students’ academic performance, and self-regulated learning, motivation, and academic self-efficacy. Research that has explored the role of motivation, self-regulated learning and academic self-efficacy on student performance in the online classroom is descriptive in nature (Artino, 2007). While this research has provided a better understanding of the simple relationships that exist between students’ performance and
their motivation, self-regulated learning, and academic self-efficacy, a limitation of these studies is that they fail to measure more complex relationships that include more than one predictor.


**Self-regulated learning.** Self-regulated learning was defined by Paul Pintrich, a leading researcher in the field of self-regulated learning, as “an active, constructive process whereby learners set goals for their learning and the attempt to monitor, regulate and control their cognition, motivation and behavior, guided and constrained by their goals and the contextual features in the environment” (Pintrich, 2000, p. 453). Self-regulated learners are adaptive constructors of meaning who control important aspects of their behavior, cognition and environment when attaining their learning goals (Pintrich, 2000) and are efficient in controlling their own learning experiences in many ways through the use of various strategies, maintenance of positive emotions during academic tasks and holding positive motivational beliefs about their learning (Schunk & Zimmerman, 1998). In turn, learners who demonstrate better learning and higher motivation for learning display more adaptive self-regulatory strategies (Pintrich, 2000).
Self-regulated learning is one of the best predictors of academic performance in the traditional classroom environment (Pintrich & De Groot, 1990) and has been found to promote students’ learning (Pintrich, 2004; Pintrich & Zusho, 2002; Schunk & Zimmerman, 2008; Zimmerman & Schunk, 2003, 2011). Furthermore, self-regulated learning has become a critical component for success in the online classroom because this environment requires such great autonomy of the student (Artino, 2007). According to Pintrich’s social cognitive framework, the most important assumption of his theory is the active, constructive assumption, which assumes that the learner constructs their own meanings, goals and strategies from their environment and their own mind (Pintrich, 2004), which is what the online learner must do. Due to the nature of the online learning environment, a more proactive and self-directed involvement of the student is needed being that they must access courses independently and structure the time, pace and strategy of their own learning processes (Jonassen, et al., 1995). In addition, research suggests that self-regulated learning is more important in the online learning environment as compared to the traditional face-to-face learning environment because of the less active role of the teacher (Jonassen, Davidson, Collins, Campbell & Haag, 1995).

Pintrich’s (2004) framework also describes four phases students go through when engaging in self-regulation. During each phase students who are self-regulated learners combine cognitive strategies with motivational beliefs, such as self-efficacy for learning, goal orientation, and interest and value (Pintrich, 2000; Zimmerman, 2000). Current research demonstrates the importance of self-regulation with evidence indicating that self-regulated learning, is a critical success factor for students in the online learning environment (Artino, 2008; Barnard, La, To, Paton & Lai, 2009). In fact, it has been suggested that students must be highly self-regulated to learn effectively in the e-learning environment (Kaufmann, 2004). According to Puzziferro
students who receive higher grades in their online courses, as compared to those who receive lower grades, are better at managing their scheduling, planning, study time and their study environment, which are all identified as phases of self-regulated learning in Pintrich’s social cognitive framework. Furthermore, this social cognitive framework emphasizes the importance of managing and regulating effort as part of self-regulatory behavior. Research reveals that students who withdraw from an online course show a lower ability to manage and regulate effort than students who received A, B or C grade (Puzziferro, 2008). Additionally, research indicates that “disorganization in self-regulated learning strategies and skills is as non-advantageous to a learner as non-existent or minimal self-regulation” (Barnard-Brak, Lan & Paton’s, 2010, p. 74).

**Motivation.** Motivation has been conceptualized in varied ways, including inner forces, enduring traits, behavioral responses to stimuli and sets of beliefs and affects (Schunk, Pintrich & Meece, 2008) with motivational components of academic performance including value beliefs, interest, personal goals, self-efficacy and students’ perceptions of the classroom environment (Garcia & Pintrich, 1995). Pintrich (2003) discussed motivation as having a reciprocal relationship to performance and learning. He indicates that motivation influences performance on learning and that what students learn and do influences their motivation. In general, when students are motivated to learn about a topic they are apt to engage in activities they believe will help them learn, such as attend carefully to instruction, mentally organize and rehearse the material to be learned, takes notes to facilitate subsequent studying, check their level of understanding, and ask for help when they do not understand material (Zimmerman, 2000a). When students are motivated to learn they often find that once they do learn they are intrinsically motivated to continue their learning (Schunk et al., 2008).
Achievement motivation is one factor that has been found to have the strongest effect on college grade point average (Robbins, Lauver, Le, Davis, & Langley, 2004). Overall, higher levels of motivation are more likely to be obtained by students when they choose to engage in a task, expend effort and persist (Pintrich & Schrauben, 1992; Schunk & Pajares, 2009). While motivation is important for learning in the traditional classroom environment (Pintrich, 2003), research indicates that the motivation to learn is a critical factor for success in online education (Sankaran & Bui, 2001; Shih & Camon, 2001). Furthermore, motivation has been found to be higher among students in online courses than among students in traditional courses (Rovai, Ponton & Wighting, 2007; Sankaran & Bui, 2001).

According to Pintrich’s framework, students’ motivational beliefs (e.g. interest, value and goal orientations) are important to their performance (Pintrich, 2004). Research in the online environment has demonstrated that certain motivational attributes such as task value (Artino & Stephens, 2006; Yukselturk & Bulut, 2007), goal orientation (Yukselturk & Bulut, 2007; Shen, Cho, Tsai, & Marra, 2013), and intrinsic motivation (Martens, Gulikers & Bastiaens, 2004) are important factors for success in the online learning environment. Research shows that students’ goal orientations in the online learning environment positively impacts academic performance (Yukselturk & Bulut, 2007; Shen, Cho, Tsai, & Marra, 2013), learning practices (Chyung, Moll & Berg, 2010; Cho & Shen, 2013) and persistence (Cho & Shen, 2013). Task value has also been found to have a significant positive relationship with students’ online success (Yukselturk & Bulut, 2007). In addition, students with high intrinsic motivation are more likely to outperform students with low intrinsic motivation (Martens, Gulikers & Bastiaens, 2004), engage in more task-related discourse (Rienties, Tempelaar, Van Den Bossche, Gijselaers & Segers, 2009) and be more explorative when given authentic computer tasks (Martens, Gulikers &
Bastiaens, 2004). Overall, students’ positive academic outcomes are positively related to their motivational beliefs about learning tasks, as well as their perceptions of the quality of instruction (Artino, 2008).

**Academic self-efficacy.** Self-efficacy was put forth by Albert Bandura during the 1970’s (Anderman & Dawson, 2011). According to Bandura (1977) the beliefs that individuals have regarding their capabilities and about the outcomes of their efforts greatly influence cognitive and affective processes that accompany their functioning and the ways they will behave. Bandura (1986) defines self-efficacy as “people’s judgments of their capabilities to organize and execute courses of action required to attain designated types of performances” (p. 391). In other words, self-efficacy refers to the specific beliefs about what one can do (Bandura, 1982). Self-efficacy is a key factor in Pintrich’s social cognitive theory (Schunk, 2005) and “one of the more important motivational beliefs for students’ achievement” (Linnenbrink & Pintrich, 2002, p. 314). Researchers indicate that self-efficacy not only includes judgments about one’s ability to accomplish a task, but one’s confidence in their skills to perform that task (Pintrich, Smith, Garcia & McKeachie, 1991). Others indicate that “students’ perception of control over their achievement outcomes are measures of self-efficacy” with control beliefs for learning referring to students’ beliefs that their own efforts influence their achievement as opposed to other external factors (Duncan & McKeachie, 2005, p. 119).

Research demonstrates that self-efficacy is related to higher levels of achievement and learning (Schunk, Meece & Pintrich, 2014) with students who have a stronger self-efficacy using more learning strategies and in turn experiencing better class performance (Pintrich & De Groot, 1990). Additionally, students who feel that they are successful in learning a task are more likely to work harder, participate more readily and persist longer and have a higher level of
achievement compared to those students who doubt their learning capabilities (Pajares, 1996). For those students who do perceive that they are performing well or are being more competent, their motivation and self-efficacy are enhanced (Schunk, Meece & Pintrich, 2014). Although concern may exist regarding the negative impact lack of success may have on a student, Schunk (1995) asserts that if students believe they can perform better by adjusting how they approach a task, lack of success will not necessarily have a negative impact on one’s self-efficacy and motivation.

According to Pintrich’s theoretical framework, self-efficacy is a key component of students’ academic performance (Schunk, 2005). Research in the online classroom reveals that students’ self-efficacy benefits them in this highly independent learning environment (Artino, 2007). In fact, evidence suggests that self-efficacy appears to be particularly important in challenging learning environments, such as the online learning environment (Cho, Shen & Laffey, 2010; Shen, Cho, Tsai & Marra, 2013) with research indicating that student’s self-efficacy in the online environment is related to academic performance (Ergul, 2004; Lynch & Dembo; Tsai, et al., 2011). Although findings are not consistent on the role of self-efficacy on student performance in the online environment, results often indicate that students’ academic self-efficacy positively impacts their academic outcomes (Tsai et al., 2011) with self-efficacy found to be positively correlated with success in online courses (Ergul, 2004, Goulao, 2014, Lynch & Dembo, 2004; Yukselturk& Bulut, 2007; Zojacova, Lynch & Espenshade, 2005;) and a powerful predictor of final course grades (Lynch & Dembo, 2004; Bell & Akroyd, 2006) accounting for significant variance in final grades (Lynch & Dembo, 2004).

Interactive relationships between and among online students’ academic performance, self-regulated learning, motivation, and academic self-efficacy. While a
greater amount of research in the traditional classroom environment investigates more complex, interactive relationships between and among student performance, academic self-efficacy, motivation and self-regulated learning, this type of research is limited in the online environment. In fact, research in the traditional classroom environment consistently demonstrates that complex, interactive relationships exists between and among students’ performance, self-regulated learning, motivation and academic performance interact (Pintrich, 2004; Pintrich & Zusho, 2002; Schunk & Zimmerman, 2008; Zimmerman & Schunk, 2003, 2011), whereas, research exploring these complex relationships in the online environment are very limited.

According to Pintrich’s social cognitive framework, it is important that students are active and constructive in their learning whereby they set goals, plan actions, and monitor, regulate and control their cognition, motivation and behavior to obtain their educational goals (Pintrich, 1999) with self-regulation of cognition, motivation and behavior mediating the relationships between personal and contextual characteristics and students’ overall achievement (Pintrich, 2004). Motivational factors identified by Pintrich, such as self-efficacy, task value, and goal orientation have been shown to be critical for self-regulation (Schunk, 2005) and to interact with behavioral, cognitive, and contextual factors to affect self-regulation (Pintrich, 2004). Based on Pintrich’s model there is a strong link between learning, motivation (including self-efficacy) and self-regulation (Pintrich, 2004).

Students’ self-regulation is found to promote their learning and their perception of greater competence, which in turn sustains their motivation and self-regulating behavior to attain new goals (Pintrich, 2004; Pintrich & Zusho, 2002; Schunk & Zimmerman, 2008; Zimmerman & Schunk, 2003, 2011). Moreover, “students who are proactive self-regulators set goals, implement effective learning strategies, monitor and assess their goal progress, establish a
productive environment for learning and maintaining a sense of self-efficacy (Zimmerman & Schunk, 2011). According to Pintrich (2000), students who are more adaptive with self-regulatory strategies exhibit better learning and higher motivation for learning. In fact, motivational processes have been found to differ among good self-regulators and poor self-regulators (Pintrich & Zusho, 2002) with good self-regulated learners demonstrating greater motivation (Pintrich & De Groot, 1990) and higher self-efficacy than poorer self-regulators (Zimmerman, 2000b). Evidence suggests that learners’ task value beliefs are positively related to the use of self-regulatory strategies (Pintrich & De Groot, 1990), with students who have a greater personal interest in a topic and those who view an activity as useful or important being more inclined to use adaptive self-regulator strategies (Schunk, 2005). Additionally, learners who demonstrate better learning and higher motivation for learning display more adaptive self-regulatory strategies (Pintrich, 2000). Research reveals that students in the online learning environment who engage in self-regulated learning are more self-efficacious (Artino, 2007, Artino & Stephens, 2006; Schunk, 2005; Shen & Cho, 2013) and that students who use self-regulated learning strategies are more responsible for their own learning, more intrinsically oriented and more challengeable (Chang, 2005).

In addition, research indicates that academic self-efficacy is positively related to the use of self-regulation, student achievement, choice, persistence, cognitive engagement, (Linnenbrink & Pintrich, 2002) academic motivation and learning (Pajares, 1996). In fact, students who perceive that they are performing well or are being more competent will experience enhanced motivation and self-efficacy (Schunk, Meece & Pintrich, 2014). According to Pintrich’s theoretical framework, self-efficacy is a key component of students’ self-regulated learning and academic performance (Schunk, 2005) with motivational self-regulatory strategies, such as
“attempts to control self-efficacy through the use of positive self-talk” occurring during all phases of self-regulation (Pintrich, 2004)

Artino (2007) asserts that academic self-efficacy plays an important role in students’ use of self-regulated learning in the online environment. Research indicates that students with higher self-efficacy have better self-regulatory behaviors (Artino, 2007), a stronger sense of what their own personal ability to succeed is, higher expectations to do well (Holder, 2007), and better performance in internet-based settings than those with lower self-efficacy (Hoffman & Spatariu, 2008). Additionally, students who have higher academic self-efficacy are more likely to regulate their effort in the online learning environment (Shea & Bidjerano, 2010) and apply more high-level learning strategies (Wang & Wu, 2008). This in turn, will result in their academic performance being positively affected (Huamao, Ying & Ronghuai, 2006). Others indicate that students’ academic self-efficacy influences their cognitive engagement in the online environment (Zhang, Shea & Bidjerano, 2010) and that it is associated with both metacognitive and interaction regulation (Shea & Bidjerano, 2010). Thus suggesting, that if students’ academic self-efficacy is enhanced it would be significant for their success (Shea & Bidjerano, 2010).

Research has also revealed that students with higher self-efficacy are not only more academically successful and more likely to use self-regulated learning strategies but they are more prone to persist in their work and schooling whereas, students with lower scores on self-efficacy are less prone to persist (Holder, 2007).

Based on an assumptions of Pintrich’s framework, self-regulatory behaviors and activities mediate the relations between learners and their environments and influence their achievements (Pintrich, 2000). Research in the online classroom has been found to support this assumption. According to Barnard, Paton & Lan (2008), self-regulated learning behaviors act as
mediators in the relationship between online course perceptions and academic achievement. Although their study found that self-regulated learning behaviors were not strongly related to academic achievement by themselves, they did find that they do mediate a positive relationship between students’ perception of online course communication in collaboration with academic achievement (Barnard, Paton & Lan, 2008). Three types of self-regulation: effort regulation, metacognitive regulation and interaction regulation have been found to mediate intrinsic goal orientation and academic self-efficacy, with both of them being positively associated with students’ achievements in online courses (Shen & Cho, 2013).

In addition, intrinsic goal orientation has also been found to have a significant positive relationship with student’s achievements in the online environment when moderated by effort regulation, metacognitive regulation and interaction regulation (Shen, Cho, Tsai, & Marra, 2013). In addition, students with intrinsic goal orientations report higher involvement in the learning process, by regulating their cognition and motivation and greater persistence with learning in challenging tasks (Cho & Shen, 2013). According to Ng (2008), students’ learning patterns (learning strategy use, motivational beliefs, regulatory strategies and attitudes towards courses) in this environment differ depending upon the type of goal orientations (mastery focused, performance focused, work focused and multiple focused), with students who focus on performance and work-related goals achieving better grades on exams than those focusing on multiple goals or mastery goals only. Furthermore, Artino & Stephens (2006) asserts that students’ task value beliefs are positively related to their use of cognitive and metacognitive learning strategies.

**Quantity and focus of the research literature on self-regulated learning, motivation and academic self-efficacy in the online classroom.** Online research is in its early stages
(Artino, 2008) and much is unknown about the role of self-regulated learning, motivation and academic self-efficacy in the college online classroom. This section will provide an overview of the quantity and focus of the current research on self-regulated learning, motivation and academic self-efficacy in the online classroom.

**Quantity of online research literature.** In general, the research literature in online learning is limited (Artino, 2007). Little research has included the investigation of the role of self-regulated learning (Artino, 2007), academic self-efficacy (Shen, Cho, Tsai & Marra, 2013), and motivation (Artino, 2007) in the online environment. While the role of self-regulated learning on academic performance in the online learning environment has been studied in various different ways, in regards to its relationship with other variables, there is not an abundance of research in any one area. In fact, little research exists that directly investigates the role of self-regulated learning on student performance in the online learning environment (Artino, 2008). In addition, research investigating the role of academic self-efficacy in the online learning environment is very limited with the majority of the existing studies of online self-efficacy focusing mostly on the computer (Shen, Cho, Tsai & Marra, 2013), considering the technological aspects of online learning and rarely investigating self-efficacy of learning and social interaction (Shen et al., 2013). Furthermore, “motivational factors are rarely in the focus of research in educational technology” (Reber, 2005 p. 93), therefore a limited amount of research that explores the role of student motivation in the online learning environment exists (Artino, 2008).

**Focus of online research literature.** Most of the online research that has investigated self-regulated learning, motivation and academic self-efficacy has been non-experimental and descriptive in nature (Artino, 2007). Being that research is so new in this area of scholarship, top
leaders have not yet clearly emerged. However, several literature reviews have thoroughly highlighted existing online research in these areas. For example, Artino (2007), provided a comprehensive overview of the current research on self-regulated learning in online education. Bekele (2010) highlighted the current research on motivation in the internet-supported learning environment, and Bannier (2010) highlighted motivation of adult learners in the online learning environment. In addition, two extensive literature reviews have thoroughly summarized the current research on self-efficacy in the online/internet based learning environments (Hodges, 2008; Tsai, Chuang, Liang & Tsai, 2011).

Self-regulated learning. According to Artino (2007), “much of the research on self-regulation in online education has focused on identifying the motivational, cognitive and behavioral characteristics of effective self-regulated learners, as well as trying to understand how these components relate to each other and to other adaptive academic outcomes” (p. 4). Specifically, most of the research which investigates the role of self-regulated learning in the online classroom environment falls into four main areas including (1) how self-regulated learning relates to other variables (self-efficacy, motivation, persistence, satisfaction, (2) self-regulated learning as a mediator, (3) the role of variables (emotions, self-efficacy, motivation) on self-regulated learning, and (4) how the online environment can support self-regulated learning.

In addition, research has found that (1) there is the potential for technology enhanced learning environments to support self-regulated learning (Steffens, 2006), (2) self-regulation is impacted by achievement-related emotions such as boredom, frustration and enjoyment (Artino & Jones, 2012), (3) students who are persistent are more inclined to practice good study habits and manage their time and activities to a greater degree than non-persisters (Holder, 2007), (4) students’ ability to engage in self-regulation in the online learning environment will likely lead to
more relevant and sophisticated discourse and ultimately greater perceived learner presence (Shea et al., 2013), and (5) the role of self-regulated learning on student satisfaction is unclear as to whether it predicts students satisfaction (Peterson, 2011; Puzziferro, 2006) or not (Kuo et al., 2014).

**Motivation.** According to Bekele’s (2010) literature review a number of studies have identified sources of motivation related to engagement, course quality, technologies and program format with other studies focusing on motivation indices and instruments for data collection (Bekele, 2010). In addition, research on motivation in the online environment has focused on how motivation can be encouraged in the online environment, the role of motivation on student persistence, discourse, satisfaction and how perception of instructor feedback influences student motivation. Some research explored the predictive nature of motivation but that too was limited. Moreover, the existing research which investigates motivation in the online learning environment tends to focus on either a trait-like model in explaining motivation or concentrates on the design of the online environment and how it will encourage optimal learner motivation. (Hartnett, St. George & Dron, 2011). Online research has not considering that individual motivation may vary in different ways in different contexts and times (Turner & Patrick, 2008). As a result, there is a need to understand motivation as a contextually bound construct in the online learning environment, as defined by Pintrich’s framework.

**Academic self-efficacy.** A considerable amount of the self-efficacy research in the online environment focuses on the role of technology and internet self-efficacy on achievement of online students (e.g. McGhee, 2010; Liang & Wu, 2010; Livingstone & Helsper, 2010; Puzziferro, 2008; Shen et al., 2013; Shi, Chen & Tian, 2011; Tsai et al, 2011; Wang and Newlin, 2002). For example, research suggests that learner performance in the classroom can be
predicted by self-efficacy for technology as well as course content (Wang and Newlin, 2002),
that internet self-efficacy plays an important role in the learning process (Tsai, 2012) as well as
on motivation (Liang & Wu, 2010) and that internet self-efficacy impacts learning outcomes
(Bucy, Tao, 2006, Tsai, Chuang, Liang & Tsai, 2011; DeTure, 2004; Joo, Bong & Choi).
Whereas, other research suggests that online technologies self-efficacy is not correlated with
student performance (Puzziferro, 2008) and that low internet self-efficacy can lead to learners
who may be less likely to engage fully in online systems and content because they lack
confidence (Sho, Chen & Tian, 2011; Livingstone & Helsper, 2010). All of which will influence
their academic performance.

Most of the research which investigates the role of self-efficacy in the online classroom
environment has been found to fall within three main categories and two subcategories (Tsai,
Chuang, Liang & Tsai, 2011). The three main categories include, (1) general internet self-
efficacy (ISE); (2) interplay between learners’ academic self-efficacy and internet-based
learning; (3) research probing learners’ internet-based learning self-efficacy and with the two sub
categories including, (1) exploration of the relationships between students’ self-efficacy and
learning process or outcomes and (2) how students’ self-efficacy might be altered in different
online environments (Tsai, Chuang, Liang & Tsai, 2011). Other research has explored the role
of self-efficacy on student satisfaction, persistence and the role of teacher feedback and
communication on self-efficacy. Although current research provides a direction for research on
self-efficacy in the online learning environment, much research is still needed to fully understand
the important role and contributions of academic self-efficacy on students’ academic
performance.
Strength and consistency of the research literature on self-regulated learning, motivation and academic self-efficacy in the online classroom. Because online research is in its early stages, especially when exploring the role of self-regulated learning, motivation and academic self-efficacy, there is a lack of depth in the research compared to the traditional classroom environment. Although some research demonstrates consistency and strength in their findings, much of the research has been found to be inconsistent. Consequently, much research is still needed to fully understand the important role and contributions of self-regulated learning, academic self-efficacy and motivation on students’ academic performance in the college online classroom.

Self-regulated learning. The research literature indicates that that self-regulated learning is a critical success factor for students in the online learning environment (Artino, 2008; Barnard, La, To, Paton & Lai, 2009) demonstrating moderate to strong relationships and predictive ability with p-values ranging from .001 to .05. Despite the limited research literature, which explores the role of self-regulated learning on academic performance, the research that does exists has consistently demonstrated that self-regulated learning plays a very important role on academic performance, both directly and as a mediator, in the online learning environment. Furthermore, self-regulated learning has been found to consistently impact self-efficacy, motivation, study habits and student discourse. Results however are inconsistent on the role of self-regulated learning on student persistence.

Motivation. Most of the literature indicates that different types of motivation, including general motivation, intrinsic motivation, goal orientation and task value are either highly significantly related to academic performance in the online classroom or are a highly significant predictor of academic performance in the online classroom with p-values ranging from .001 to
Although limited, the research has consistently demonstrated that motivation plays an important role on academic performance in the online learning environment. In fact, Bekele’s (2010) literature review revealed that positive correlations exist between achievement and motivation with performance being predicted based on motivation. Only one study suggested that motivation/self-determination failed to predict learning outcomes (Chen & Jang, 2010). In addition, intrinsic goal orientation has also consistently been found to be significantly related to students’ success and achievement in the online learning environment (Yukselturk & Bulut, 2007; Shen, Cho, Tsai, & Marra, 2013; Chyung, Moll & Berg, 2010).

Moreover, mixed results have been found when comparing motivation in the online classroom to that of the traditional classroom. Some evidence suggests that motivation is higher in the online classroom environment compared to the traditional classroom environment (Bekele, 2010; Roblyer, 1999; Rovai, Ponton, Wighting & Baker, 2007), whereas others suggest that motivation is lower among online students compared to traditional classroom students (Qureshi, Morton & Antosz, 2002). Furthermore, some indicate that motivation is the same in both environments (Dutton, Dutton & Perry, 2002). Due to these inconsistencies, it is difficult to determine whether motivation plays the same role in the online classroom environment as it does in the traditional classroom environment.

**Academic self-efficacy.** Research exploring the role of various types of self-efficacy in the online learning environment is inconsistent (Tsai et al., 2011) with a clear link between self-efficacy for performance and computers not yet being established in online courses (Hodges, 2008). Unlike the consistent findings that students’ self-efficacy beliefs in the traditional classroom environment are significantly and positively related to academic performance.
(Hodges, 2008), research in all areas of self-efficacy in the online learning environment have produced mixed results.

Many, but not all studies in this review, found that various types of self-efficacy (academic, internet, technology) played a moderate to strong significant role in students’ academic performance in the online learning environment with p-values ranging from .001 to .05. Overall, prior research suggests that self-efficacy (academic, internet, technology) in the online learning environment (1) is highly significantly related to academic performance (Goulao, 2014; Joo, Lim & Kim, 2013; Lynch & Dembo, 2004; Wang & Newlin, 2002; Yukselturk & Bulut, 2007; Zajcova, Lynch & Espenshade, 2005;), (2) accounts for a significant amount of variance alone or jointly (Bell and Akroyd, 2006), (3) acts as a significant predictor of academic performance (Lynch and Dembo, 2004), and (4) is a moderator between student performance and learning strategy use (Huamao, Ying & Ronghuai, 2006).

Despite the fact that many studies found that self-efficacy played a moderate to significant role on academic performance, other studies in contrast found that students’ academic self-efficacy (Chyung, Moll & Berg, 2010) and their self-efficacy for course content (Lee & Witta, 2001) did not predict students’ learning and performance. Furthermore, online technologies self-efficacy was found to be a poor predictor of student success (DeTure, 2004; Lee & Witta, 2001). Despite the fact that self-efficacy has proven to be very important for academic performance in the traditional classroom environment, the role of self-efficacy on academic performance in the online learning environment is not yet fully understood.

The Role of Minor Student and Teacher Related Factors
The role of prior online learning experience and the degree requirements of courses will be discussed as minor student-related factors in online learning and the role of instructor feedback will be discussed as a minor teacher-related factor in online learning.

Prior online learning experience. Research demonstrates that students who have prior experience taking online courses are more confident, self-regulatory, organized and that they utilize more learning strategies and are more likely to complete an online course. In fact, research indicates that students become more responsible for their own learning as they gain experience with online learning (Richardson & Newby, 2006). Richardson & Newby (2006) found that as students begin and take more online courses, differences in strategy use begin to emerge and appear to become more self-regulatory in their strategy use. Evidence also suggests that students are learning to be more responsible for their own learning in the online environment as exhibited by the fact that students were found to show an increase in organizing their time as they gained additional experience with their online courses (Richardson & Newby, 2006). Other research demonstrates that the number of previous distance learning courses students take impacts student completion of online courses as compared to those who drop out (Osborn, 2001). Those students who are more experienced with distance learning courses have greater familiarity with the technological aspects of the virtual classroom and have greater confidence in their abilities to take advantage of the opportunities that exists in this learning environment (Osborn, 2001).

Degree requirements of courses. Evidence suggests that whether a course is a degree requirement or an elective can influence students’ perception of the value of that course and thus their performance in that course. According to Coleman & Fararo (1992), students may feel that there is a greater “payoff” when taking a degree required course than an elective course and as a
result they are more likely to persist in a course that is required. Furthermore, greater persistence and success are observed when students believe that a course is relevant to their needs (Reed, 1981).

Instructor feedback. A preponderance of evidence has revealed that teacher feedback has a powerful influence on students’ performance (Hattie & Gan, 2011), significantly improving their learning and performance, if communicated correctly (Shute, 2008). Feedback is among one of the top ten influences on student achievement (Hatti & Timperley, 2007) with results from a meta-analyses, revealing an average effect size of \( d = .79 \), which is twice the average effect (Hattie & Timperley, 2007). Although feedback has shown to have a significant impact on students’ performance, merely prescribing a lot of feedback does not guarantee that students will benefit (Hattie & Gan, 2011). In order for feedback to be effective, it must provide the learner with both verification and elaboration (Kulhavy & Stock, 1989). “If formative feedback is to serve as a corrective function, even in its simplest form, it should (a) verify whether the student’s answer is right or wrong and (b) provide information to the learner about the correct response (either directive or facilitative)” (Shute, 2008, p. 159). Although research is extensive in the area of formative feedback, different studies report incongruent findings regarding the feedback variable (Shute, 2008).

In addition to the role of teacher feedback on academic performance, it has also been shown to influence students’ motivation, thinking and self-efficacy. According to Zimmerman and Martinez-Pons (1992) feedback is an important sources of information that will address misconceptions, support cognitive processes, enhance motivation and improve achievement. Feedback that emphasizes self-improvement, mastery and achievement should have a positive effect on learners’ self-efficacy (Schunk, Meece & Pintrich, 2014) as well as motivation
(Dempsey, Driscoll, Litchfield, 1993) with elaborated feedback being related to positive motivation (Narciss & Huth, 2006). Research indicates that multiple benefits exist as a result of formative feedback which include deep learning, motivation and self-esteem and self-regulated and transferable learning (Koh, 2008). Additionally, Gikandi, Morrow & Davis (2011) argue that “dynamic social relations between the student and the teacher are essential to provide effective feedback because it enhances motivation and satisfaction, which may encourage students’ active engagement” (pp. 2333-2351). Overall, effective formative feedback “focuses on both products and processes of learning and assessment, and facilitates self-regulatory process among students” (Gikandi et al., 2011, p. 2346).

**Gap in the Research**

As a whole, there is a large gap that exists in the research between what we know about the role and importance of academic self-efficacy, self-regulated learning and motivation in the traditional classroom and the limited knowledge and information we have about academic self-efficacy, self-regulated learning and motivation in the online learning environment. The body of literature that exists on these constructs in the traditional classroom environment is extensive and is based on decades of research whereas, research in the online learning environment does not yet have the same depth or consistency since its research is still in its infancy.

Currently researchers think that the online learning environment is effective (Shachar & Neumann, 2003). However, little is known about the role of self-regulated learning, motivation and academic self-efficacy in the online learning environment due to the limited research that exists. Therefore, we lack a clear understanding of the importance and role of self-regulated learning, motivation and academic self-efficacy in the online environment. Based upon this information and knowledge, we are left with a large gap in the research and a lack of
understanding on the role of these constructs in the online learning environment. Since little research exists in this area, there is a need to (1) explain how self-regulated learning, motivation and academic self-efficacy play a role in students’ online learning and academic performance, (2) fill in the research gap that exists on the role of self-regulated learning, motivation and academic self-efficacy on academic performance in the online learning environment, and (3) provide useful knowledge to online instructors regarding the role of these constructs so this information can be used by them to design more effective online courses that foster self-regulated learning, motivation and academic self-efficacy.

The empirical evidence that results from this study will not only add to the current literature and help to fill in the research gap that exists in this area but it will assist in building a foundation of knowledge and understanding that will provide online instructors with important information that will assist them in developing more effective online courses. According to Artino & Ioannou, (2008), there are many instructional implications for online teachers related to this type of knowledge, including: assessing components of students’ self-regulated learning in order to supply individual feedback and support; creating an environment that will develop and support students’ self-efficacy; creating task relevance that is grounded in authentic problems to generate student interest; enhancing teaching presence; and promoting and engaging in social modeling. Currently, little research exists on the role of self-regulated learning, motivation and academic self-efficacy on academic performance in the college online learning environment. Therefore, there is a need for continued research in this area to gain a better understanding of the importance and role of these constructs in the online learning environment.

Hypotheses
Based upon the theoretical framework for this study and empirical research findings, the following five hypotheses are proposed based on the three research questions listed in chapter 1.

**Hypothesis 1.** Students’ self-regulated learning skills, motivation level and academic self-efficacy positively influence academic performance in college online courses.

**Hypothesis 2.** Students who are both highly motivated and self-efficacious demonstrate greater academic performance in their college online courses than students who are not motivated and self-efficacious.

**Hypothesis 3.** Students who are both highly motivated and who engage in self-regulated learning demonstrate greater academic performance in their college online courses than students who are not motivated or self-regulatory.

**Hypothesis 4.** Students who are both highly self-efficacious and who engage in self-regulated learning demonstrate greater academic performance in their college online courses than students who are not self-efficacious or self-regulatory.

**Hypothesis 5.** Students who are highly motivated, self-efficacious and who engage in self-regulated learning demonstrate greater academic performance in their college online courses than students who are not motivated, self-efficacious and self-regulatory.
Chapter 3: Method

This section discusses the research design, the participants, power analysis, measures, procedure and the data analysis plan that were used in this study.

Research Design

An experimental research design’s unique strength is in describing the consequences attributable to deliberately varying a treatment (Shadish, Cook & Campbell, 2002). According to Shadish, Cook and Campbell (2002) the purpose of both randomized and quasi experiments is to test descriptive causal hypotheses about manipulable causes. However, it is not always appropriate to use an experimental design when exploring many of the significant and important questions posed by educators and educational psychologists (Jaeger & Bond, 1996). When it is not feasible or desirable to identify a cause and effect relationship, based on your research questions, a plausible alternative is a correlational research study.

In a correlational investigation, the experimenter seeks to understand and explain how variables are related as they find them, without a research-defined strategy or treatment through which the researcher attempts to draw causal inferences (Jaeger & Bond, 1996). Additionally, when conducting correlational research data can be analyzed using multiple regression analysis, which serves two fundamentally different purposes, explanation and prediction (Cohen, et al., 2003). When a hypotheses is derived from formal theory or previous research, a multiple regression analysis can be used to explain variations in the outcome variable (Cohen, et al., 2003). According to Cohen, et al. (2003) variations in the outcome variable can be explained when a hypotheses proposes some form of a relationship between one or more factors of interest and an outcome variable. On the other hand, when the purpose is to predict an outcome based on the factors of interest, a multiple regression analysis can be used to forecast an outcome based on
the data collected on the factors of interest (Cohen, et al., 2003). For the purposes of this study and the desire to explain the role of self-regulated learning, motivation and academic self-efficacy on academic performance in college online courses, a correlational research design (Keppel, 2004) was used.

A correlational research design was appropriate to use for this study because the focus was to identify and explain the existing relationships between self-regulated learning, motivation, academic self-efficacy and student academic performance in the college online classroom. Although using an experimental design is more desirable because you have the ability to illuminate causal inferences (Shadish, Cook & Campbell, 2002), an experimental design was not appropriate for this study because of the absence of manipulated variables and differential treatments (Keppel, 2004). Additionally, an observational study would not have been appropriate either because a study without a treatment is not an observational study (Rosenbaum, 1995).

Furthermore, given that the focus of this study was to explain the role of self-regulated learning, motivation and academic self-efficacy on student academic performance in the online classroom, a variation of a post-test only design identified by Shadish, Cook and Campbell, (2002) was used to guide the data collection in this study. Although, Shadish, Cook and Campbell (2002) indicate that the post-test only design is used when data is collected after participants are exposed to a treatment, a variation of this post-test only design was used in this study to guide data collection at the end of the participants’ experience in an online course, as opposed to after participants exposure to a treatment.

A modified post-test only design was more appropriate for this study as opposed to a pre-test only design (measuring these constructs at the beginning of the semester), or a mid-test only
design (measuring the constructs in the middle of the semester) for three major reasons. First, the posttest-only design has been widely and successfully used in similar studies that investigated the role of various constructs (e.g., self-regulated learning, motivation, self-determination, self-efficacy, student satisfaction, learning strategies, developmental differences and learner presence) on academic performance in the college online classroom (Artino & Stephens, 2009; Barnad, Lan, To, Paton & Lai, 2009; Barnard-Brak, Lan & Paton, 2010; Chen & Jang, 2010; Cho & Shen, 2013; Johnson, R. & Stewart, C., 2013; Kuo, Walker, Radovan, 2011; Schroder & Belland, 2014; & Shea & Bidjerano, 2010). Second, the pretest-only design would be measuring students’ pre-existing self-regulated learning, academic self-efficacy and motivation, which is very likely to be reflective of their experiences in the traditional classroom as opposed to their current experience in the online environment. Finally, a mid-test only design has not been used as a design in the research literature.

**Participants**

Participants. Participants who completed the questionnaire included 127 student volunteers from 16 100-level or 200-level online college courses. After further narrowing the sample to address outliers and influential cases, the final sample included 122 participants. Participants were 18-55 years of age, predominately white and middle class, and included 108 females and 14 males. Participation in this study was optional.

Power analysis. Sample size was determined using Cohen’s power analysis (Cohen, 1992). According to Cohen (1992), “for research planning, it is most useful to determine the $N$ necessary to have a specified power for a given $\alpha$, and ES” (p. 156). Cohen (1992) recommended that, when research is planned that will use multiple regression/correlation analysis, with significance of $\alpha = .01$, a medium effect size, $f^2 = .15$ and three independent
variables, a sample size of 108 is needed. Being that 127 students participated in this study, the desired sample size was obtained to achieve the desired power.

**Measures**

**Academic Performance.** My outcome variable was student academic performance in college online courses. Academic performance was determined by students’ grades in their online course during Weeks 12 to 14 of the college semester. Students’ overall grades were calculated using the grades they received on all assignments and quizzes from Week 1 to Weeks 12 to 14 of their course. Students were asked to self-report their current overall grade on the questionnaire. Given that the purpose of this study was to evaluate student academic performance, measuring students’ grades was a valid measure (Callahan, Finney, Kirst & Usdan, 2005; Kuh, Kinzie, Buckley, Bridges & Hayek, 2006; Pascarella & Terenzini, 2005).

**Self-regulated learning.** My first explanatory variable was students’ self-regulated learning. Student self-regulated learning was measured using scales from the learning strategies section of the Motivated Strategies for Learning Questionnaire (MSLQ), an 81 item self-report questionnaire (Pintrich, Smith, Garcia, & McKeachie, 1991) (see Appendix A). According to Duncan and McKeachie (2005), the learning strategies section consists of three general types of scales (cognitive, metacognitive and resource management). For the purposes of this study, the metacognitive control strategies scale (metacognitive self-regulation) and two of the resource management subscales (time and study environment management, and effort regulation) were used to measure students’ self-regulated learning. These three scales have been used in prior research to measure self-regulated learning in students and have been found to be a valid measure (Artino & Jones, 2012; Kuo, Walker, Schroder, Bellard, 2014; Puzziferro, 2008). Additionally, Pintrich, Smith, Garcia, & McKeachie (1991) indicate that metacognitive self-
regulation (i.e. students’ self-regulation of cognition), time and study environment (i.e. regulating and managing study environments and time) and effort regulation (i.e. control effort and attention when faced with distractions or uninteresting tasks) are important components of self-regulation, all of which are measured with the three learning strategies subscales being utilized to measure self-regulated learning in this study.

The metacognitive self-regulation subscale of the MSLQ measures students’ use of strategies that help them control and regulate their own cognition, including: planning and setting goals, monitoring one’s comprehension and regulating or adjusting one’s approach depending on the task (Duncan & McKeachie, 2005). This subsection of the MSLQ consists of 12 items, three of which were slightly modified to suit the online classroom environment. The 12 items in this subsection include questions 39r, 40, 41, 43, 45, 46, 47, 48r, 50, 52, and 53 and 54 (see Table 1).

Table 1

| Motivated Strategies for Learning Questionnaire Scales, Items and Alpha |

<table>
<thead>
<tr>
<th>MSLQ Scales</th>
<th>Items</th>
<th>Alpha</th>
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<tbody>
<tr>
<td><strong>Scale</strong></td>
<td></td>
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<tr>
<td>Motivation Scales</td>
<td></td>
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<tr>
<td>Intrinsic Goal Orientation</td>
<td>1, 13, 18, 20</td>
<td>.74</td>
</tr>
<tr>
<td>Extrinsic Goal Orientation</td>
<td>6, 9, 11, 25</td>
<td>.62</td>
</tr>
<tr>
<td>Task Value</td>
<td>3, 8, 14, 19, 22, 23</td>
<td>.90</td>
</tr>
<tr>
<td>Self-Efficacy Scales</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control of Learning Beliefs</td>
<td>2, 7, 15, 21</td>
<td>.68</td>
</tr>
<tr>
<td>Self-Efficacy for Learning and Performance</td>
<td>4, 5, 10, 12, 16*, 17, 24, 26</td>
<td>.93</td>
</tr>
<tr>
<td>Learning Strategies Scales</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time and Study Environment Management</td>
<td>28, 30, 32r, 34, 35, 36*, 37, 38r*</td>
<td>.76</td>
</tr>
<tr>
<td>Effort Regulation</td>
<td>42r, 44, 49r, 51</td>
<td>.69</td>
</tr>
<tr>
<td>Metacognitive Self-Regulation</td>
<td>39r*, 40, 41, 43, 45, 46, 47*, 48r, 50, 52, 53, 54*</td>
<td>.79</td>
</tr>
</tbody>
</table>

Note. * Questions 16, 36, 38, 39, 47 and 54 have been slightly modified from the original MSLQ format (Pintrich, Smith, Garcia & McKeachie, 1991)
An example of a question from the metacognitive control scale section of the MSLQ is, “When I become confused about something I’m reading for this class, I go back and try to figure it out”.

The resource management scale of the MSLQ includes four subscales on students’ regulatory strategies for controlling resources other than their cognition (Duncan & McKeachie, 2005). For the purposes of this study I used two of the resource management subscales (time and study environment management and effort regulation) because they have been identified by Pintrich, Smith, Garcia, & McKeachie (1991) as important measures of self-regulated learning. Pintrich et al. (1991) indicated that the time and study environment management subscale measures students’ ability to manage and regulate their time and study environments.

The time and study environment management subscale consists of 8 items, 2 of which were slightly modified to suit the online learning environment, questions 28, 30, 32r, 34, 35, 36, 37 and 38r (see Table 1). An example of a question from the time and study environment management subscale of the MSLQ that was modified to suit the online classroom environment is “I make good use of my study time for this course”. The effort regulation subscale focuses on students’ ability to self-manage and reflects a commitment to completing study goals, even when they experience difficulties or are distracted (Pintrich et al., 1991). The effort regulation subscale consists of four items, questions 42r, 44, 49r and 51. An example of a question from the effort regulation subscale section of the MSLQ is, “I work hard to do well in this class even if I don’t like what we are doing”.

**Rationale for using the MSLQ to measure self-regulated learning.** The MSLQ has proven to be a valid, reliable measure of self-regulation and has been widely used in research investigating the role of self-regulated learning in both the traditional (McKeachie, Lin & Middleton, 2004; Pintrich & De Groot, 1990) and online classroom environments (Artino &
Stephens, 2009; Kuo, Walker, Schroder & Bellard, 2014). It was appropriate to use for this study because (1) it demonstrates good predictive validity with scale correlations with final grades ranging from .07 to .67 for the subsections of the MSLQ utilized for this study (Pintrich et al., 1999); (2) it has relatively good internal reliability with Cronbach’s alphas ranging from .69 to .79 in the subsections of the MSLQ being utilized for this study (Pintrich et al., 1991); (3) it has been used to more deeply understand the individual differences that exist in self-regulated learning (e.g. Duncan & McKeachie, 2005; Harackiewicz, Barron, Tauer, Carter & Elliot, 2000; McKenzie & Gow, 2004; McKeachie, Lin & Middleton, 2004; Perry, Hladkyj, Pekrun & Pelletier, 2001; Polleys, 2001; Wolters, 2003), therefore further justifying the value of using the MSLQ to evaluate self-regulated learning, and (4) the MSLQ was designed based on the social-cognitive theory (Duncan & McKeachie, 2005), the theoretical framework driving this study.

Motivation. My second explanatory variable was students’ motivation. Student motivation was measured using the Motivated Strategies for Learning Questionnaire (MSLQ). The motivation section of the MSLQ includes 6 subsections that can be used to assess student motivation. According to Pintrich, et al. (1991), the different scales of the MSLQ can be used singly or together to fit the needs of the researcher. For the purposes of this study I used the motivation scale that measures the motivational construct of value. The value component consists of three motivation subsections that measure intrinsic goal orientation (focuses on mastery and learning), extrinsic goal orientation (focuses on grades and approval received from others) and task value (judgments about how useful, interesting and important the course content is to the student) (Garcia & Pintrich, 1995). Duncan and McKeachie (2005) indicate that these three subscales measure the general motivation construct of value beliefs, the reasons students engage in an academic task. These motivation subsections consist of 14 items, questions 1, 3, 6,
8, 9, 11, 13, 14, 18, 19, 20, 22, 23 and 25 (see Table 1). An example of a question from the value motivation scale section of the MSLQ is, “It is important for me to learn the course material in this class”.

**Rationale for using the MSLQ to measure student motivation.** The MSLQ has proven to be a valid, reliable measure of student motivation and has been widely used in research investigating the role of motivational constructs in both the traditional (Pintrich & De Groot, 1990) and online classroom environments (Chang, 2005; Chyung, Moll, & Berg, 2010). It is appropriate to use for this study because (1) it demonstrates good predictive validity with scale correlations with final grades ranging from .02 to .41 for the subsections utilize for this study from the motivation scale of the MSLQ (Pintrich et al, 1993); (2) it has relatively good internal reliability with Cronbach’s alphas ranging from .62 to .93 in the subsections of the motivation section of the MSLQ being used in this study (Pintrich et al, 1993); (3) the MSLQ was found, in previous research, to be a valid measure of motivational and cognitive constructs (Pintrich, Smith, Garcia & McKeachie, 1993) and has been utilized frequently to address the nature of motivation and to help refine theoretical understanding of the between- and within-domain specificity of motivational constructs (e.g. Bong, 2001, 2004) as well to assess motivational and cognitive effects of internet-based, online and computer-based instruction (Duncan & McKeachie, 2005); and (4) the MSLQ was designed based on the social-cognitive theory, which is the theoretical framework driving this study, with the student represented as an active processor of information, whose beliefs and cognitions mediate important instructional input and task characteristics (Duncan & McKeachie, 2005).

Based on the social-cognitive framework that the MSLQ was founded, assumptions exist that “motivation and learning strategies are not traits of the learner, but rather that motivation is
dynamic and contextually bound and that the learning strategies can be learned and brought under the control of the student” (Duncan & McKeachie, 2005, p. 117), which means that student motivation varies across different courses. According to Duncan & McKeachie (2005), the MSLQ is distinguished from another widely used self-report instrument, the Learning and Study Strategies Inventory (LASSI) (Weinstein, Palmer & Schulte, 1987). The LASSI evaluates learning strategies and attitudes towards learning at a general level, whereas the MSLQ focuses on the course level being that the course is the most appropriate level of analysis because it is positioned between the very general and the global level of all learning situations (Duncan & McKeachie, 2005).

**Academic self-efficacy.** My third explanatory variable was students’ academic self-efficacy. Student academic self-efficacy was measured using scales from the learning strategies section of the Motivated Strategies for Learning Questionnaire (MSLQ). For the purposes of this study I used the motivation scale, which measured the motivational constructs of expectancy (self-efficacy). The expectancy component consists of two subscales that assess perceptions of self-efficacy and control of beliefs for learning, which focuses on the students’ beliefs that they can accomplish a task (Garcia & Pintrich, 1995). These motivation subsections consist of 12 items, 1 of which is slightly modified to suit the online learning environment, questions 2, 4, 5, 7, 10, 12, 15, 16, 17, 21, 24 and 36. An example of a question from this motivation scale section of the MSLQ is, “I believe I will receive an excellent grade in this class”.

**Rationale for using the MSLQ to measure self-efficacy.** The MSLQ has proven to be a valid, reliable measure of academic self-efficacy and has been widely used in research investigating the role of self-efficacy in both the traditional (Pintrich & De Groot, 1990) and online classroom environments (Chyung, Moll & Berg, 2010; Puzziferro, 2008) and is
appropriate to use for this study because, (1) it demonstrates good predictive validity with scale correlations with final grades ranging from .14 to .59 for the motivation subsections of the MSLQ being utilized for this study (Pintrich et al., 1999); (2) it has relatively good internal reliability with Cronbach’s alphas ranging from .68 to .93 in the subsections of the motivational scales of the MSLQ being utilized in the study (Pintrich et al., 1993); (3) online research studies have utilized the self-efficacy for learning and performance subscale of the MSLQ to evaluate self-efficacy (Chyung, Moll & Berg, 2010; Puzziferro, 2008).

Chyung, Moll & Berg 2010 utilized the self-efficacy for learning and performance subscale of the MSLQ to measure students’ self-efficacy in an e-learning environment. According to Chyung et al. (2010) the self-efficacy levels in their study were similar to the benchmark established by Pintrich et al. (1991) in their earlier research. The results demonstrated that the instrument reliability in their study, measured by Cronbach Alpha levels was (α = .88), which is similar to Pintrich and colleagues’ (1991) benchmark (α = .93) (Chyung et al., 2010), which illustrates that using the MSLQ to measure self-efficacy in the online environment is a reliable measure, and 4) the MSLQ was designed based on the social-cognitive theory (Duncan & McKeachie, 2005), which emphasizes the importance of self-efficacy and is the theoretical framework driving this study.

**Prior-online course experience.** My first control variable was students’ prior online course experience. Prior online course experience was measured by asking students to identify how many online courses they had taken prior to the current course. Because the purpose of this variable was to control for prior online course experience, the number of previous online courses students have taken was a valid measure.
Instructor feedback. My second control variable was the type of feedback students received from their teachers. Instructor feedback was measured using four questions which asked students to identify the level of feedback their instructors provide them. The questions assessed whether teachers provided elaborative feedback, which is the most effective feedback (Kulhavy & Stock, 1989), or whether they did not provide elaborate feedback to their students. The questions were based on Dempsey’s et al. (1993) and Shute’s (2008) definitions of types of teacher feedback. An example of a question is, “My instructor explains why my responses or answers are correct or incorrect”.

The questions that were used in this study to assess instructor feedback were a valid measure to use because (1) the questions were based on existing definitions of teacher feedback, which have been utilized in prior research (Dempsey et al., 1993; Shute, 2008 & Wang & Wu, 2008), and (2) the questions effectively measured whether teachers provided effective feedback (elaborative feedback) to students or not.

Degree requirements of courses. My third control variable was degree requirements of courses. Degree program requirement for the course being taken was measured by asking students if the current online course they were taking was required for their degree program. Because the purpose of this variable was to control for differences that may occur as a result of the course being required for a degree program as opposed to the course being an elective, asking students to identify whether the course was required or whether it was an elective was a valid measure.

Procedure

Institutional Review Board (IRB) approval was obtained on March 17, 2015, from the University at Albany Research and Compliance Office. Based on this approval, data collection
occurred during Weeks 12 to 14 of the Spring 2015 semester and during Week 6 of the six week Summer 2015 session.

After IRB approval, faculty from 100 college online courses from SUNY Adirondack were asked to include their courses in this study. Of the 100 online courses, 16 courses were volunteered for use. All 344 students enrolled in these 16, 100-level and 200-level online courses were eligible to participate and were not part of a special population. Prospective participants from the 16 online courses were asked to participate in this study and were informed in both a recruitment e-mail and the informed consent that there were no risks involved in participating in the study. Both of these documents included an overview of the research study, what it entailed and reassurance of privacy and anonymity. Both documents encouraged students to take their time to think about whether they would accept or decline to participate in the study. In addition, they were reassured that there would not be any negative consequences if they did not participate. The students were also informed that the information collected through the questionnaire was anonymous to ensure their privacy and confidentiality and that they could withdraw from the study at any time if they choose to, without penalty.

Prospective participants received a recruitment e-mail at the beginning of Week 12 during the Spring 2015 semester and at the beginning of Week 6 during the Summer 2015 session. The e-mail informed them that if they desired to participate in the research study they had to read the informed consent, which they were instructed to access via the link at the bottom of that page. If they did not desire to participate, they were thanked for their time. Those students who intend to participate were further instructed to (1) check and document their current grade in their course prior to beginning, (2) read the informed consent, that they were directed to access via a link at the bottom of the e-mail, and (3) complete the questionnaire, that they were
directed to access via a link at the bottom of the informed consent. At the end of Week 14 in the Spring and at the end of Week 6 in the Summer, all questionnaire results were collected from my personal online learning repository. Given that the results from all of the participating online courses went directly to my personal online learning repository, other faculty did not have access to the questionnaire responses. In addition, the questionnaire was formatted to be anonymous within the online courses, therefore no identifiable information was associated with the actual questionnaire results in any way.

Data Analysis

Research question 1. To address my first research question of what the main effect of self-regulated learning, motivation and academic self-efficacy is on academic performance in college online courses, I used hierarchical multiple regression analysis (Cohen, Cohen, West & West, 2003). Hierarchical multiple regression was used to identify if self-regulated learning, a continuous variable, motivation, a continuous variable and academic self-efficacy, a continuous variable, accounted for student academic performance in college online courses, a continuous variable. The order that the explanatory variables (self-regulated learning, motivation and academic self-efficacy) were entered was determined by the nature of the research question, its major goal and to control for confounding variables.

According to Cohen, Cohen, West & Aiken (2003), causal priority and the removal of confounding variables are some of the basic principles underlying the hierarchical order for entry. Because the primary focus of this research question was to identify how well the explanatory variables explained student academic performance, all three explanatory variables were entered simultaneously with degree program requirements of the course, prior online course experience and teacher feedback as control variables. Since research indicates that students’
prior online course experience can influence their academic performance in a course (Richardson & Newby, 2006) and that instructor feedback can influence students’ self-regulation (Koh, 2008), motivation (Dempsey, Driscoll, & Litchfield, 1993) and self-efficacy (Schunk, Meece & Pintrich, 2014), these variables were entered as control variables in the hierarchical multiple regression model to control for previous online course experience and instructor feedback. Additionally, degree program requirement of the course was entered as a control variable in the hierarchical multiple regression model to control for differences that may have existed as a result of the course being required or not. By adding these variables into the hierarchical multiple regression model, this allowed for the unique effect of the explanatory variables to be observed. Therefore, the first variables that were entered were, instructor feedback, degree program requirement, and prior online experience. The second entry included all three explanatory variables (self-regulated learning, motivation and academic self-efficacy) being entered simultaneously. All explanatory variables were entered together because all three variables have been found to be important contributors to academic performance (Pintrich & De Groot, 1990; Schunk & Zimmerman, 2008).

**Justification.** Given the nature of this research question, hierarchical multiple regression (Cohen et al., 2003) was more appropriate than simple regression because the goal was to explain the role of self-regulated learning, motivation and academic self-efficacy on the outcome variable, student performance in college online courses. A simple regression would not have been sufficient for this research question because its objective was to identify how well the three explanatory variables explained student academic performance (the outcome variable) and a simple regression would only analyze whether one outcome variable is predicted or explained by one predictor or explanatory variable.
**Research question 2.** To address my second research question of whether there was an interaction effect between self-regulated learning and motivation; self-regulated learning and academic self-efficacy and motivation and academic self-efficacy on student academic performance in college online courses I used a hierarchical multiple regression analysis to identify if there were synergistic interactions between (1) self-regulated learning, a continuous variable and motivation, a continuous variable, (2) self-regulated learning and academic self-efficacy, a continuous variable, and (3) motivation and academic self-efficacy on academic performance in college online courses.

**Justification.** Given the nature of this research question, hierarchical multiple regression was more appropriate than the dichotomization of each pair of continuous independent variables to analyze the interaction effect using an Analysis of Variance (ANOVA). According to Cohen et al., (2003), dichotomizing the two continuous independent variables in order to analyze their interaction using an ANOVA is problematic because it “decreases measured relationships between variables and it will lower the power for detecting a true nonzero interaction between the two continuous predictors” (p. 256).

**Research question 3.** To address my third research question of whether there was an interaction effect between self-regulated learning, motivation and academic self-efficacy on student academic performance in college online courses. I used a hierarchical multiple regression analysis to identify if there was a synergistic interaction between self-regulated learning, a continuous independent variable, motivation, a continuous independent variable and academic self-efficacy, a continuous independent variable on student academic performance in college online courses, a dependent continuous variable.
**Justification.** Given the nature of this research question, multiple regression is more appropriate than dichotomization of the three continuous independent variables, self-regulated learning, motivation and academic self-efficacy, using an Analysis of Variance (ANOVA) as mentioned earlier.

**Procedure for the hierarchical multiple regression.** The following procedure was used when conducting the hierarchical multiple regression analysis. First, initial checks were run to identify outliers and unusual cases using boxplots. Second, an initial regression analysis was run to check the assumptions of linearity, no multicollinearity (collinearity diagnostics), independence of errors (Durbin-Watson), homoscedacity, and normality and determination was made that assumptions were met. Third, data entry corrections were made, influential cases were removed and an insignificant control variable (degree requirement) was removed prior to the main analysis.

Fourth, a hierarchical multiple regression analysis was run and included the following steps. (1) Control variables were entered in step 1 (prior online experience and instructor feedback). (2) All centered explanatory variables were simultaneously entered in step 2 (self-regulated learning, academic self-efficacy and self-regulated learning) to address my first research question of what the main effect of self-regulated learning, motivation and academic self-efficacy is on academic performance in college online courses. Explanatory variables were centered because they were included in the subsequent interaction terms. Centering variables helped ensure a meaningful interpretation and elimination of nonessential multicollinearity between first-order explanatory variables and explanatory variables that carried their interaction with other explanatory variables (Cohen et al, 2003). (3) Three 2-way interactions terms were entered simultaneously (self-regulated learning x motivation; self-regulated learning x academic
self-efficacy and motivation x academic self-efficacy) in step 3 to address my second research question of whether there was an interaction effect between self-regulated learning and motivation; self-regulated learning and academic self-efficacy and motivation and academic self-efficacy on student academic performance in college online courses. (4) A 3-way interaction term was entered in step 4 (self-regulated learning x academic self-efficacy x motivation) to address my third research question of whether there was an interaction effect between self-regulated learning, motivation and academic self-efficacy on student academic performance in college online courses.

Fifth, the model summary was interpreted to (1) identify the fit of the regression model by looking at the $R^2$ to identify the proportion of variance the model explained. (2) identify which model was the best fit by looking at the $\Delta R^2$ and $\Delta F^2$, and (3) identify whether the model was a significant fit of the overall data by looking at the ANOVA. Sixth, interpreted model parameters and looked at the contribution of each individual variable to the regression model and identified if each made significant contributions in explaining the outcome.
Chapter 4: Results

A correlational research design was used to examine the existing relationships between self-regulated learning, motivation, academic self-efficacy and student academic performance in college online classrooms, with prior online experience, requirement of courses and instructor feedback acting as control variables. A variation of a post-test only design identified by Shadish, Cook and Campbell, (2002) was used to guide the data collection at the end of the participants’ experience in their online course. A questionnaire including 60 questions was used to collect data and test the following hypotheses:

**Hypothesis 1.** Students’ self-regulated learning skills, motivation level and academic self-efficacy positively influence academic performance in college online courses.

**Hypothesis 2.** Students who are both highly motivated and self-efficacious demonstrate greater academic performance in their college online courses than students who are not motivated and self-efficacious.

**Hypothesis 3.** Students who are both highly motivated and who engage in self-regulated learning demonstrate greater academic performance in their college online courses than students who are not motivated or self-regulatory.

**Hypothesis 4.** Students who are both highly self-efficacious and who engage in self-regulated learning demonstrate greater academic performance in their college online courses than students who are not self-efficacious or self-regulatory.

**Hypothesis 5.** Students who are highly motivated, self-efficacious and who engage in self-regulated learning demonstrate greater academic performance in their college online courses than students who are not motivated, self-efficacious and self-regulatory.

**Examination of the Data**
**Missing data.** Investigation of descriptive statistics revealed 26 missing values, which means that .0028% of the data was missing. According to Cohen et al. (2003), if missing data accounts for a very small fraction of the data (3% or less) then there is little difference in how the problem is handled. Therefore, being that the percentage of missing data was so small and that there were two types of missing values (students’ grade and missing responses), two different methods were used to address the missing data in this study, listwise deletion and mean substitution. Listwise deletion was used to address the one missing case in which a participant did not self-report their current grade in the course. This method was used because without the respondent’s actual grade, which is the measure of the outcome variable, an accurate assessment of whether their motivation, self-regulated learning and academic self-efficacy explained their grade would not occur. In addition, mean substitution was used to address the other 25 missing responses. According to Cohen et al. (2003) mean substitution is a method that can be used to address missing data where the mean of the variable is used to estimate the value of the missing data.

**Outliers and influential cases.** Boxplots, regression diagnostics and casewise diagnostics were used to identify outliers and influential cases. As seen in Figure 1, boxplots detected 3 extreme cases for grades, cases 23, 44 and 66. In addition, casewise diagnostics revealed that these cases were found to have residuals with standard deviations greater than 3, which confirms that these cases were outliers. Although boxplots provide useful information about outliers, Cohen et al. (2003) indicates that the visual inspection of outliers is more challenging when there are two or more independent variables. In these cases, he recommends the use of regression diagnostics as a supplement to the visual inspection. Therefore, regression diagnostics were used as an additional
method to examine three characteristics of potentially errant data points, (1) leverage, (2) discrepancy, and (3) influence, to ensure all outliers and influential cases were detected.

Two regression diagnostics were performed. The first set of regression diagnostics were run to identify potential errant data points. As seen in Table 2, results demonstrate the presence of high but acceptable leverage, .005 - .746. According to Cohen et al. (2003) leverage values < .991 are acceptable, which means that no cases were found to be unusual in terms of their influence on the IVs in this study. In addition, results show a large discrepancy, with studentized residuals ranging from -4.493 to 2.719 (see Table 2). When studentized residuals are > ± 3.5 this
indicates that there is a discrepancy between the predicted and observed values on the outcome variable (Cohen et al., 2003). Lastly, results demonstrate high influence, with Cook’s D ranging from .000 to 1.639 and DFBETAS ranging from -.611 to 1.245 (see Table 2). According to Cohen et al. (2003), a Cook’s D > 1 indicates that the case has influence and it affects overall characteristics of the regression equation and a DFBETAS < +1 indicates that the case has influence and affects each individual $B$. After examination of the Cook’s D values and DFBETAS values, 2 specific cases were identified as having high influence, cases 46 and 127. Overall, five cases were identified as problematic (cases 23, 44, 46, 66 & 127), which resulted in careful consideration of how these outliers and influential cases should be addressed.

Table 2

<table>
<thead>
<tr>
<th>Regression diagnostics of leverage, discrepancy and influence.</th>
<th>Regression Diagnostics 1</th>
<th>Regression Diagnostics 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>127</td>
<td>122</td>
</tr>
<tr>
<td>Leverage</td>
<td>0.005 to 0.746</td>
<td>0.005 to 0.573*</td>
</tr>
<tr>
<td>Discrepancy (studentized residual)</td>
<td>-4.493 to 2.719</td>
<td>-3.303 to 3.001*</td>
</tr>
</tbody>
</table>

Influence

| Cook’s D                                                      | .000 to 1.639            | .000 to .155*            |
| DFBETAS                                                       | -.611 to 1.245            | -.421 to .489*           |

Note. *Acceptable range.

Although multiple methods can be used to address outliers and influential cases, deletion is the classic method of addressing outliers (Chatterjee & Wiseman, 1983 and Cohen et al., 2003). According to Cohen et al. (2003), deletion is the simplest method to use and “it will provide estimates of the regression coefficients that are very similar to those produced by more complex robust regression procedures” (p. 415). After careful consideration, all five cases were deleted for the following reasons, (1) when outliers or influential cases are present, “regression analyses may produce results that reflect a small number of atypical cases rather than the general relationship observed in the rest of the data” (Cohen et al., 2002, p. 392). (2) a single outlier or
influential case can have a large impact on the results of a regression analysis, especially when
the regression equation contains interactions and the sample is small (Cohen et al., 2003), (3)
high influence was observed in cases 46 and 127, which affects the overall characteristics of the
regression equation and the individual $B$, (4) a large discrepancy was found between the
predicted and observed values on the outcome variable, and (5) three extreme outliers for grades
were identified in both the boxplots and casewise diagnostics (cases 23, 44 and 66). Although
the boxplots revealed additional outliers, cases 23, 44 and 66 had residuals with standard
deviations greater than three, which means they will distort the regression statistics (Wiggins,
2000). Being that the other outliers identified in the boxplots had residuals that fell within three
standard deviations, they were not considered for remedial action.

After the outliers were removed, cases 23, 44, 46, 66 and 127, a second set of regression
diagnostics were run. As seen in Table 2, results indicate that leverage, discrepancy, and
influence (Cook’s D and DFBETAS) all fell within acceptable ranges after the removal of the
outliers, with leverage values ranging from .005 to .573, discrepancy values ranging from -3.303
to 3.001 and influence values for Cook’s D ranging from .000 to .155 and DFBETAS from -.859
to .489.

Assumptions

“All statistical procedures, including multiple regression, require that assumptions be
made for their mathematical development” (Cohen, et al., 2003). According to Cohen et al.
(2003), the violation of an assumption may lead to two possible problems. First, there may be
bias in the regression coefficients and second, the estimate of the standard error of the regression
coefficient may be biased, which could cause incorrect hypotheses tests and confidence intervals.
Cohen et al. (2003), suggests that both graphical displays and statistical tests can be used to
detect violations of assumptions, but indicates that graphical displays may detect a wider variety of problems than statistical tests.

**Linearity.** Linearity means that the form of the relationship is properly specified and the outcome is linearly related to the explanatory variables (Cohen et al., 2003). As seen in Figure 2, the general trend of the data in this study (lowess line) does not exhibit any large or systematic deviations from the 0-line. According to Cohen et al. (2003), if the trend of the data generally follows the 0-line this suggests that the relationships between the explanatory variables (self-regulated learning, motivation and academic self-efficacy) and the predicted values (students’ grades) approximate linearity. Therefore, the assumption of linearity in this study has been met.

*Figure 2.* Scatterplot of residuals vs. predicted values for grades, self-regulated learning, motivation and academic self-efficacy. The horizontal line represents the value of 0 for the residuals (0-line). The lowess line is also displayed which represents the trend of the data.
**Independence of residuals.** Independence of residuals means that the residuals of the observations are independent of one another (Cohen et al., 2003). When observations are not independent of each other the standard errors are affected and thus problems arise and result in incorrect significance tests and standard errors (Cohen et al., 2003). The assumption of independence can be tested using the Durbin-Watson test. Residuals are considered independent if \( d \) falls between 1 and 3 (Durbin & Watson, 1951). The Durbin-Watson test revealed that \( d = 1.842 \), which means that the residuals are independent and the assumption of independence of residuals has been met.

**Normality.** Normality of residuals exists when the residuals around the regression line are assumed to have a normal distribution for any value of the independent variable \( X \), (Cohen et al., 2003). It is important to meet this assumption being that violations could potentially lead to problems with significance tests and confidence intervals in small sample sizes (Cohen et al., 2003). Although different graphical methods can be used to assess whether residuals follow a normal distribution Cohen et al. (2003) indicates that normal q-q plot is far easier than the normal curve overlay in determining whether the residuals follow a normal distribution. As shown in Figure 3, the residuals of self-regulated learning, motivation and academic self-efficacy appear close to the superimposed straight lines, thus indicating that the residuals have close to a normal distribution. The q-q plot for grades however, shows that the residuals deviate slightly from the superimposed straight line. To evaluate this further, a histogram of the residuals was used to assess normality being that histograms are often used by analysts to supplement q-q plots (Cohen et al., 2003). As seen in Figure 3, there is no significant departure from normality. Therefore, the assumption of normality has been met.
Figure 3. Q-q plots of residuals with superimposed straight lines for (a) grades, (b) self-regulated learning, (c) motivation, and (d) academic self-efficacy, and a histogram of grades with a normal curve overlay.

**Multicollinearity.** Multicollinearity occurs when one or more independent variables is highly correlated with other independent variables in the regression equation (Cohen et al.,...
When multicollinearity exists the regression coefficient will result in a very large standard of error and large confidence intervals, which will make the estimate of little value (Cohen et al., 2003). The variance inflation factor (VIF) is a measure that is used to determine the degree of multicollinearity. “The VIF provides an index of the amount that the variance of each regression coefficient is increased relative to a situation in which all of the predictor variables are uncorrelated” (Cohen et al., 2003, p. 423). According to Cohen et al. (2003), if the VIF is 10 or more, serious multicollinearity exists with the corresponding independent variables. For this study, the VIF ranged from 1.025 to 4.592, which means that the assumption of multicollinearity has been met.

**Homoscedasticity.** Homoscedasticity occurs when the variance of the residuals around the regression line is constant regardless of the value of X (Cohen et al., 2003). Scatterplots are used to identify whether there is a relationship between the variability of the residuals and the predicted values (Cohen et al., 2003). As seen in Figure 4, the variance of the residuals around the regression line is relatively constant. This means that the assumption of homoscedasticity was met.

**Descriptive Statistics**

**Characteristics of the sample.** The population used in this study included 2,016 students from 100 college online courses at SUNY Adirondack, with a convenience sample of 344 students from 16 of those courses (see Table 3). Participants included 127 student volunteers who completed the questionnaire with a final sample of 122 participants, which resulted from removing a total of five outliers and influential cases. Participants in the final sample included 108 females and 14 males whose grades ranged from 57% to 108% (see Table 3). As seen in Table 3, on average, students’ grades were higher for
Figure 4. Scatterplots of residuals vs. predicted values for (a) grades, (b) self-regulated learning, (c) motivation, and (d) academic self-efficacy.

those who participated in this study ($M = 91, SD = 9.7$) compared to those in the sample ($M = 84, SD = 1.42$), with course averages ranging from 70% to 97%. In addition, the courses used in this study had attrition rates ranging from 0% to 17.39% (see Table 3).

**Correlations between variables.** Correlation analyses indicate that significant linear relationships were found to exist between students’ grades and self-regulated learning ($r = .35$), motivation ($r = .24$), academic self-efficacy ($r = .61$), and instructor feedback ($r = .32$), with academic self-efficacy having the strongest significant linear relationship (see Table 4). This means that an increase in students’ self-regulated learning, motivation, or academic self-efficacy,
Table 3

Means and Standard Deviations of Grades, Number of Online Courses and Students, and Attrition Rates (N = 122)

<table>
<thead>
<tr>
<th>Grades</th>
<th>Online Courses</th>
<th>Students</th>
<th>M</th>
<th>SD</th>
<th>Attrition Rates</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Population</td>
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<td>84</td>
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<td>344</td>
<td>16</td>
<td>122</td>
<td>91</td>
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<td>Final sample</td>
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<td>344</td>
<td>16</td>
<td>122</td>
<td>91</td>
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<td>Course 16</td>
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</tbody>
</table>

Note. Attrition rates are based on registrar calculations

or an increase in instructor feedback, is associated with an increase in students’ grades, with academic self-efficacy being most highly related to student performance. Furthermore, positive significant linear relationships were found among self-regulated learning, motivation, academic self-efficacy, and instructor feedback (see Table 4). Self-regulated learning was found to be significantly correlated with motivation, academic self-efficacy, and instructor feedback, respectively ($r = .72$, $r = .63$, $r = .19$). In addition, motivation was significantly correlated with academic self-efficacy and instructor feedback, respectively ($r = .65$, $r = .25$) and academic self-
efficacy was significantly correlated with instructor feedback ($r = .36$). In other words, self-regulated learning, motivation, academic self-efficacy, and instructor feedback are all positively related to each other.

Being that significant correlations were found between the explanatory variables, the assumption of multicollinearity was reexamined. Results indicate that the variance inflation factor (VIF), which is a measure of the degree of multicollinearity, ranged from 1.025 to 4.592. Therefore, because the VIF was less than 10, the assumption of multicollinearity was met, which indicates that serious multicollinearity does not exist with the corresponding explanatory variables in this study.

Table 4

<table>
<thead>
<tr>
<th>Measure</th>
<th>M</th>
<th>SD</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Grades</td>
<td>91.00</td>
<td>9.7</td>
<td>1.00</td>
<td>.35**</td>
<td>.24**</td>
<td>.61**</td>
<td>.32**</td>
<td>.07</td>
<td>.17</td>
</tr>
<tr>
<td>2. Self-regulated learning</td>
<td>121.50</td>
<td>20.6</td>
<td>1.00</td>
<td>.72**</td>
<td>.63**</td>
<td>.19*</td>
<td>-.04</td>
<td>-.04</td>
<td></td>
</tr>
<tr>
<td>3. Motivation</td>
<td>77.20</td>
<td>13.3</td>
<td>1.00</td>
<td>.65**</td>
<td>.24**</td>
<td>-.03</td>
<td>.05</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Academic self-efficacy</td>
<td>70.80</td>
<td>10.9</td>
<td>1.00</td>
<td>.36**</td>
<td>-.03</td>
<td>.08</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Instructor feedback</td>
<td>31.80</td>
<td>6.0</td>
<td>1.00</td>
<td>-.05</td>
<td>-.01</td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>6. Degree requirement</td>
<td>.73</td>
<td>.45</td>
<td>1.00</td>
<td></td>
<td>.06</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Prior online experience</td>
<td>2.10</td>
<td>3.0</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

Note. * $p < .05$ ** $p < .01$

Fitting Hierarchical Regression Models to Best Explain the role of Self-Regulated Learning, Academic Self-Efficacy and Motivation on Students’ Grades in College Online Courses
Centering explanatory variables. The purpose of this analysis was to identify the model that best fits the data, as a step towards explaining the role of self-regulated learning, academic self-efficacy and motivation on students’ grades in college online courses. To do this, a hierarchical multiple regression analysis was used to determine the degree to which variables entered later in the analysis account for variance in the criterion over and above that which is accounted for by variables entered earlier in the analysis (Petrocelli, 2003). Prior to performing the hierarchical regression analysis, which includes interaction terms, all explanatory variables were centered based on procedures recommended by Aiken and West (1991). Aiken and West’s (1991) procedure of centering variables is commonly used in research that includes interactions and hierarchical multiple regression (Bidjerano & Dai, 2006; Wei, Ku, Russell, Mallinckrodt & Liao, 2008; Wei, Liao, Heppner, Chao & Ku, 2012 and Wei, Yeh, Chao, Carrera & Su, 2013). According to Aiken and West (1991) and Cohen et al. (2003), all variables included in an interaction term should be centered. By centering the variables, interpretation of first-order coefficients will be straightforward and meaningful in terms of the variables under investigation, and it will eliminate nonessential multicollinearity (Cohen, et al., 2003).

Fitting models. After explanatory variables were centered, a hierarchical multiple regression was performed. In Step 1, three control variables were entered, prior online experience, instructor feedback and degree requirement. Degree requirement was not significant however, so it was removed and a new hierarchical regression was performed. In Step 1 of the main regression, the two control variables (prior online experience and instructor feedback) were entered. In Step 2, all three explanatory variables (self-regulated learning, motivation and academic self-efficacy) were entered to test the main effects. In Step 3, three two-way interactions (self-regulated learning X motivation, self-regulated learning X academic self-
efficacy and motivation X academic self-efficacy) were included to test the three interaction effects. In Step 4, a three way interaction was entered (self-regulated learning X motivation X academic self-efficacy) to test the three-way interaction hypothesis.

As shown in Table 5, the initial baseline model, which included three control variables, was significant, \( R^2 = .117 \). However, one of the control variables, degree program requirement, was not significant in accounting for students’ grades, \( \hat{\beta} = .169 \). In addition, degree program requirement was not related to any of the other variables, including students’ grades, self-regulated learning, academic self-efficacy, motivation, prior online experience, and instructor feedback (see Table 4 for details). According to Cohen et al. (2003), when variables are left in the regression model that are not related to the other independent variables or the dependent variable, there will be a small increase in the standard errors of the regression coefficients and will thus result in confidence intervals that are slightly too large and statistical power of the tests of the regression coefficient that are slightly reduced (Cohen et al., 2003). Therefore, degree program requirements, which was found to have no relation to grades, self-regulated learning, academic self-efficacy and motivation, was not included in the main hierarchical multiple regression analysis.

As shown in Table 5, summarizing the results of fitting the best model, hierarchical multiple regression indicates that the Model of Step 2 is the best fit, \( \Delta R^2 = .317 \). Although Model 1 was a good fit, \( R^2 = .117 \), Model 2 was a better fit because it significantly improved our ability to account for students’ grades by 31.7% compared to Model 1.

While results indicate that the main effect of self-regulated learning was not significant in accounting for students’ grades in this model, \( \hat{\beta} = .138 \), it will be included in the subsequent analyses for four reasons, (1) it has been found in prior research to be an important predictor of
Table 5

Model Fit and Parameter Estimation of Hierarchical Multiple Regression Analysis Using Student Academic Performance as the Outcome and Self-Regulated Learning, Motivation and Academic Self-Efficacy as Explanatory Variables and Instructor Feedback, Degree Program Requirement and Prior Online Experience as Control Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Parameter Estimation</th>
<th>Model Fit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$b$(SE) $\hat{\beta}$</td>
<td>$R^2$ F $\Delta R^2$ $\Delta F$</td>
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<tr>
<td><strong>Preliminary analysis of control variables</strong></td>
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<td></td>
</tr>
<tr>
<td>Step 1</td>
<td></td>
<td>.117 6.366 **</td>
</tr>
<tr>
<td>Instructor feedback</td>
<td>.527(0.138) .327***</td>
<td></td>
</tr>
<tr>
<td>Degree program requirement</td>
<td>1.738(1.855) .080</td>
<td></td>
</tr>
<tr>
<td>Prior online experience</td>
<td>.552(0.279) .169*</td>
<td></td>
</tr>
<tr>
<td><strong>Primary hierarchical regression</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Step 1 (Model 1)</td>
<td></td>
<td>.118 9.120***</td>
</tr>
<tr>
<td>Instructor feedback</td>
<td>.520(0.138) .323**</td>
<td></td>
</tr>
<tr>
<td>Prior online experience</td>
<td>.567(0.279) .174</td>
<td></td>
</tr>
<tr>
<td>Step 2 (Model 2)</td>
<td></td>
<td>.426 18.972*** .317 22.278***</td>
</tr>
<tr>
<td>Instructor feedback</td>
<td>.215(0.119) .133</td>
<td></td>
</tr>
<tr>
<td>Prior online experience</td>
<td>.460(0.228) .141</td>
<td></td>
</tr>
<tr>
<td>Self-regulated learning</td>
<td>.065(0.050) .138</td>
<td></td>
</tr>
<tr>
<td>Academic self-efficacy</td>
<td>.609(0.089) .683***</td>
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</tr>
<tr>
<td>Motivation</td>
<td>-.247(0.077) -.340*</td>
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</tr>
<tr>
<td>Step 3 (Model 3)</td>
<td></td>
<td>.430 12.391*** .017 1.233</td>
</tr>
<tr>
<td>Instructor feedback</td>
<td>.210(0.119) .130</td>
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</tr>
<tr>
<td>Prior online experience</td>
<td>.426(0.229) .130</td>
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</tr>
<tr>
<td>Self-regulated learning</td>
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<td>Academic self-efficacy</td>
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<td>Motivation</td>
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<td>Self-regulated learning x academic self-efficacy</td>
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<td>Self-regulated learning x motivation</td>
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<td>Academic self-efficacy x motivation</td>
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<td>Academic self-efficacy</td>
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<tr>
<td>Motivation</td>
<td>-.260(0.085) -.359**</td>
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</tr>
<tr>
<td>Self-regulated learning x academic self-efficacy</td>
<td>-.010(0.006) -.240</td>
<td></td>
</tr>
<tr>
<td>Self-regulated learning x motivation</td>
<td>.003(0.003) .133</td>
<td></td>
</tr>
<tr>
<td>Academic self-efficacy x motivation</td>
<td>.005(0.009) .081</td>
<td></td>
</tr>
<tr>
<td>Self-regulated learning x academic self-efficacy x motivation</td>
<td>.000(0.000) .078</td>
<td></td>
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</tbody>
</table>

Note. *$p < .05$ **$p < .01$ ***$p < .001$ . Bonferroni adjusted significance levels for model 2: *$p < .01$ ($p < .05$) **$p < .002$ ($p < .01$) ***$p < .00012$ ($p < .001$)
students’ grades in online courses (Artino, 2007) and therefore it is important to see if it is important in this research study, (2) there is theoretical basis for the inclusion of self-regulated learning, (3) studies using hierarchical regression analysis have included nonsignificant main effect variables in all steps of the hierarchical regression (Wei, Ku, Russell, Mallinckrodt & Liao, 2008; Wei, Liao, Heppner, Chao & Ku, 2012 and Wei, Yeh, Chao, Carrera & Su, 2013, and (4) sensitivity analysis, which is recommend by Cohen et al., 2003 to assess the robustness of a model with and without the variable in question, indicates that the model is robust regardless of the inclusion or exclusion of self-regulated learning. This means that the inclusion of self-regulated learning does not negatively impact the robustness of the model therefore additionally justifying its inclusion in the remaining analyses.

Model 3, which added 3 two-way interaction terms, did not significantly improve the model fit, $\Delta R^2 = .017$, accounting for an insignificant increase of 1.7% of the variance in students’ grades. In addition, Model 4, which added a three-way interaction of the main effects, did not significantly improve the model fit either, $\Delta R^2 = .001$, adding only .1% of additional explanation of variance to Model 3. These results indicate that Model 2, which includes the main effects of self-regulated learning, motivation and academic self-efficacy, is the best fitting model. Thus, this model was used to address each of the hypotheses in this study.

**Main Effects of Self-Regulated Learning, Motivation and Academic Self-Efficacy on Students’ Academic Performance**

As shown in Table 5, Model 2 is the best fit in explaining the main effects of self-regulated learning, motivation and academic self-efficacy, $\Delta R^2 = .317$. These results illustrate
that self-regulated learning, motivation and academic self-efficacy account for 43% of the variance in students’ grades with a large effect size, $R^2 = .426$, $f^2 = .742^1$.

Prior to interpreting the partial regression coefficients of model 2, a Bonferroni adjustment was made to alpha levels to control for Type 1 errors. Results indicate that the main effect of academic self-efficacy best accounts for students’ grades, $\hat{\beta} = .683$. The main effect of motivation is second best in accounting for students’ grades, $\hat{\beta} = -.340$, and the main effect of self-regulated learning is not significant in accounting for students’ grades, $\hat{\beta} = .138$. These findings suggest that after allowing for the linear effects of the other explanatory variables, students’ academic performance in college online courses is best accounted for by higher academic self-efficacy and lower levels of motivation. This means that a 1 point increase in students’ academic self-efficacy level is associated with a .61 increase ($b = .61$) in their grades, without the effects of self-regulated learning and motivation. In contrast, a 1 point increase in students’ motivation level is associated with a .25 decrease ($b = .25$) in their grades, without the effects of self-regulated learning and academic self-efficacy.

**Two-Way Interaction Effects of Self-Regulated Learning and Motivation, Self-Regulated Learning and Academic Self-Efficacy, and Motivation and Academic Self-efficacy on Students’ Academic Performance**

As shown in Table 5, Model 2 is the best fitting model, $\Delta R^2 = .317$, which means that the addition of the 3 two-way interactions in Model 3 did not significantly improve the proportion of variance that accounts for students’ grades, $\Delta R^2 = .017$. These results suggest that the interactions of self-regulated learning and motivation, self-regulated learning and academic self-

\[ f^2 = \frac{R^2}{1 - R^2} \]

is an effect size index (Cohen, 1992).
efficacy, and motivation and academic self-efficacy do not significantly account for the variance in college students’ grades in college online classes.

**Three-Way Interaction Effect of Self-Regulated Learning, Motivation and Academic Self-Efficacy on Academic Performance**

As shown in Table 5, Model 2 is the best fitting model, $\Delta R^2 = .317$, which means that the addition of the three-way interaction in Model 4 did not significantly improve the proportion of variance that accounts for students’ grades, $\Delta R^2 = .001$. These results suggest that the interactions of self-regulated learning, motivation and academic self-efficacy do not significantly account for the variance in college students’ grades in college online classes.
Chapter 5: Discussion

The main purpose of this study was to investigate the role of self-regulated learning, motivation and academic self-efficacy on academic performance in college online courses. As previous research is limited in this area, unlike in the traditional classroom environment, a gap exists in the literature regarding a full understanding of the importance and role of these constructs in the online learning environment. As a result, three major questions were addressed in this current study: (1) Do self-regulated learning, motivation and academic self-efficacy play a role in academic performance in online courses? (2) Do the interactions of self-regulated learning and motivation, self-regulated learning and academic self-efficacy, and motivation and academic self-efficacy play a role in academic performance in online courses? (3) Does the interaction of self-regulated learning, motivation and academic self-efficacy play a role in academic performance in online courses?

Summary of Findings

In this study, it was found that students’ achievement in online courses is related to their self-regulatory behaviors, motivation level and academic self-efficacy in a complex way. Academic self-efficacy was found to be most highly related to students’ achievement, both alone and when the linear effects of motivation and self-regulated learning were taken into account. Furthermore, evidence reveals that when the linear effects of multiple student-related factors are considered at one time, there is a change in the originally estimated relationships between student performance and motivation, and self-regulated learning. This change includes student performance becoming negatively related to motivation, and self-regulated learning no longer having a significant relationship with student performance. Moreover, results demonstrate that self-regulated learning, motivation and academic self-efficacy do not interact to influence students’ performance.
Contributions of This Study

Overall, this study makes several important contributions to the field of online learning. First, it adds new empirical evidence to the limited research that exists in this area of online education. Currently, there is a limited amount of research that explores the role of self-regulated learning (Artino, 2007), motivation (Artino, 2008), and academic self-efficacy (Shen et al., 2013) in the online classroom. The study helps to fill the gap that exists in the research between what we know about the importance and significance of academic self-efficacy, motivation and self-regulated learning in the traditional classroom and the limited knowledge and information we have about academic self-efficacy, motivation and self-regulated learning in the online environment.

Second, it provides new and valuable information about simple and complex relationships that exist between and among students’ performance in online courses, and their academic self-efficacy, motivation and self-regulated learning. Specifically, results demonstrate that some simple relationships between students’ performance, and motivation, self-regulated learning, and academic self-efficacy change when multiple real life student-related factors are accounted for in a complex relationship.

The Role of Academic Self-Efficacy, Motivation and Self-Regulated Learning on Students’ Academic Performance in College Online Courses

There are three important findings relevant to how well college students perform in online courses which include: (1) the simple relationships between academic performance and academic self-efficacy, motivation, and self-regulated learning, (2) the complex relationships between academic performance and academic self-efficacy, motivation, and self-regulated
learning, and (3) the lack of interaction effects between and among academic self-efficacy, motivation, and self-regulated learning on student performance.

**Understanding simple and complex relationships between students’ academic performance and self-regulated learning, motivation, and academic self-efficacy.** Results of this study reveal that simple positive relationships exist between student academic performance and their academic self-efficacy, motivation level and their self-regulatory behaviors. However, when the linear effects of all student-related factors are accounted for at one time, these simple relationships change.

**Academic self-efficacy.** Results confirm the importance of students’ academic self-efficacy in the online classroom environment. In particular, evidence suggests that highly self-efficacious students perform better academically in online courses than those who are not self-efficacious. Furthermore, academic self-efficacy is found to be highly related to student success regardless of whether or not other major student-related factors are taken into account. In fact, when the linear effects of motivation and self-regulated learning are accounted for, academic self-efficacy is the most important factor in explaining variations in students’ grades. This means that when students’ judgments about their ability to accomplish a task is high and their confidence in their skills to perform that task are high, they will perform better in their online courses regardless of their motivation level or self-regulatory abilities. These findings support prior online research (Cho, Shen & Laffey, 2010; Shen, Cho, Tsai & Marra) which indicates that academic self-efficacy is particularly important in challenging learning environments, and it is a key component to academic success in these learning environments (Hodges, 2008).

While, current research evidence is not consistent in explaining the role of academic self-efficacy on student performance in the online environment, results often indicate that students’
academic self-efficacy has a positive impact on their academic outcomes (Tsai et al., 2011) with self-efficacy found to be positively correlated with success in online courses (Ergul, 2004, Goulao, 2014, Lynch & Dembo, 2004; Yukselturk & Bulut, 2007; Zojacova, Lynch & Espenshade, 2005;) and a powerful predictor of final course grades (Lynch & Dembo, 2004; Bell & Akroyd, 2006), which supports the results of this study. Moreover, the importance of academic self-efficacy on students’ performance is supported by Pintrich’s social cognitive framework, where self-efficacy is viewed as a key component of academic performance (Pintrich et al., 2000).

Although evidence is compelling regarding the importance of academic self-efficacy on students’ performance in both the traditional and online classroom, it is important to consider whether higher academic self-efficacy leads to higher performance or if higher performance leads to higher academic self-efficacy. It may be difficult to discern whether academic self-efficacy or student performance comes first when both are measured at the same time, while prior research suggests that self-efficacy precedes students’ performance. In fact, research indicates that students who are self-efficacious achieve more, work harder, persist longer, persevere in the face of adversity, and have greater optimism and lower anxiety, despite previous achievement or ability (Pajares, 2009).

However, this does not mean that previous achievements do not contribute to one’s self-efficacy. According to Bandura (1977), mastery experiences, which refers to one’s judgment of their competence related to previous attainment on related tasks, are one source of influence on self-esteem. As Bandura explained (1977) success can raise mastery expectations and repeated failures can lower them, however, neither success alone will increase one’s efficacy beliefs, nor will all failures contribute to a decrease in efficacy beliefs. Therefore success does not guarantee
higher self-efficacy nor does lack of success guarantee lower self-efficacy (Schunk, 1995). Lack of success, however, may provide opportunity to learn how to turn failure into success by honing one’s skills (Bandura, 1993).

Overall, results of this study clearly demonstrate the importance of students’ academic self-efficacy on their performance in the online classroom. Given the abundance of evidence that demonstrates that academic self-efficacy positively impacts students’ academic outcomes, it is reasonable to conclude that highly self-efficacious students will perform better academically in online courses.

**Motivation.** The correlation analysis findings reveal that motivation is positively associated with students’ performance in their online courses. This means that the more highly motivated a student is, the higher their grades are likely to be, which is consistent with prior research (Robbins, Lauver, Le, Davis, & Langley, 2004). However, when a complex relationship between motivation and performance is considered in the multiple regression analysis context, which accounts for the linear effects academic self-efficacy and self-regulated learning, it is surprising to find that grades are higher among students with lower motivation levels. Although these findings support my earlier study, which also found that motivation was lower among higher achieving students (Basila, 2014), they contradict motivation research in both the online (Sankaran & Bui, 2001; Shih & Camon, 2001) and traditional classroom (Robbins, Lauver, Le, Davis, & Langley, 2004).

Overall, empirical evidence indicates that high achievement motivation is one factor that has the strongest effect on college grade point average (Robbins, Lauver, Le, Davis, & Langley, 2004) with the motivation to learn being a critical factor of student success in online education (Sankaran & Bui, 2001; Shih & Camon, 2001). Moreover, based on Pintrich’s social cognitive
framework, you would expect that high motivation would contribute to better academic performance, being that motivation is seen as the process whereby goal-directed activities are initiated and sustained (Schunk, Meece & Pintrich, 2014). In this study, however, results contradict these earlier findings.

Because results from this study and my earlier study contradict prior research, and because changes occurred in the direction of the complex relationship between motivation and academic performance, it is important to consider several factors that may have contributed to the discrepant findings and the change in the relationship between motivation and performance. Specifically, I will address this issue in two steps. Step 1, it is important to consider why the direction of the relationship between motivation and academic performance changed from a positive relationship to a negative relationship after the linear effects of self-regulated learning and academic self-efficacy were accounted for. Step 2, it is also important to consider why the findings of both this study and my earlier study (Basila, 2014) contradict prior research on motivation in the traditional and online classrooms (Robbins, Lauver, Le, Davis, & Langley, 2004; Sankaran & Bui, 2001; Shih & Camon, 2001).

For Step 1, two factors that could have contributed to the change in the direction of the relationship between students’ performance and their motivation include: (1) multicollinearity and (2) that the linear effects of academic self-efficacy and self-regulated learning were accounted for in the complex relationship between motivation and academic performance, whereas the linear effects were not accounted for in the simple relationship between motivation and performance alone.

First, it is reasonable to question the presence of multicollinearity when the sign changes from a positive correlation coefficient (simple relationship) to a negative regression coefficient
(complex relationship). Often a sign change such as this means that multicollinearity is present (Cohen et al., 2003). Cohen et al. (2003) indicates that multicollinearity can be measured using the variance inflation factor (VIF) and tolerance measure. The VIF in this study ranges from 2.097 to 2.376. Because each VIF is less than 10, this means that serious multicollinearity is not an issue (Cohen et al., 2003). Furthermore, the tolerance measure, which ranges from .421 to .477, also demonstrates that there is not a serious problem with multicollinearity because the tolerance values are all greater than .10 (Cohen et al., 2003). Based on the VIF and tolerance measure, it is safe to say that multicollinearity did not cause the change in sign from the correlation coefficient (simple relationship) to the regression coefficient (complex relationship).

Second, it is reasonable to suspect that the change in the complexity of the relationship from simple to complex between motivation and academic performance, contributed to the change in the sign. According to De Veaux, Velleman & Bock (2009), it is possible that a significant linear relationship in one direction, between an outcome variable and an explanatory variable, can become the opposite sign in a multiple regression. This change in sign can occur because of the change in the meaning of the coefficient when in a multiple regression (De Veaux, Velleman & Bock, 2009). When a correlation is conducted, only the relationship between the outcome variable and explanatory variable are considered. However, when a multiple regression is conducted, the sign of the regression coefficient is about the relationship of the explanatory variable and outcome variable after allowing for the linear effects of the other variables (De Veaux, Velleman & Bock, 2009). In other words, the regression coefficient differs from the respective correlation coefficient because the regression coefficient is adjusted for the relationships between the other variables (Wampond & Freund, 1987).
In this study, motivation was not perfectly correlated with the other explanatory variables, academic self-efficacy and self-regulated learning. Therefore, each of the other variables added something unique to the students’ academic performance (Wampond & Freund, 1987). Based on this information, it is reasonable to say that the change in sign in the relationship between motivation and academic performance is the result of the linear effects of academic self-efficacy and self-regulated learning being accounted for in the complex relationship between motivation and academic performance.

For Step 2, two factors that need to be considered as possibly contributing to the discrepant findings of this study include: (1) the instrument used to measure motivation and (2) restriction of range. First, when results contradict prior research, it is important to consider whether the instrument used in the study provides a valid and reliable measure of your construct. The instrument used in this study, the MSLQ, has been shown to be a valid, reliable measure of student motivation and has been widely used in research investigating the role of motivational constructs in the traditional classroom (Pintrich & De Groot, 1990, Pintrich et al., 1993) and in the online classroom (Chang, 2005; Chyung, Moll, & Berg, 2010). While the motivation scale of the MSLQ was used to measure both motivation (value beliefs) and academic self-efficacy (expectancy), different subscales were used to prevent the same constructs from being measured. Therefore, because the MSLQ has been found to be a reliable and valid measure in both the online (Chang, 2005; Chyung, Moll, & Berg, 2010) and traditional classroom environments (Pintrich & De Groot, 1990; Pintrich et al., 1993), and because separate motivation subscales of the MSLQ were used to measure motivation and academic self-efficacy, it can be determined that the MSLQ is a reliable and valid measure of student motivation. Moreover, it is reasonable
to say that the instrument used to measure motivation in this study, the MSLQ, did not contribute to the discrepant findings of this study.

Second, the restriction of range in students’ grades may have impeded my ability to fully observe differences in motivation across the entire grade distribution of A through F. Because 80% of the participants’ grades were within the A and B range, motivation is more reflective of higher achieving students. Therefore, it is possible that the low motivation levels observed among the higher achieving students would not be considered low if the study included a better distribution of grades from A through F. If the grade distribution included a larger number of lower achieving students, this may have allowed for a better assessment of how students’ grades are related to motivation level in general and when self-regulated learning and academic self-efficacy are taken into account. This restriction of range in grades may have contributed not only to the findings on motivation in this study, but in my previous study as well (Basila, 2014).

Overall, evidence is not clear regarding the role of motivation on student performance in the online classroom. However, based on the results of this study and my prior study (Basila, 2014), which suggest that the relationship between motivation and student performance change from positive to negative when the effects of other student-related factors are accounted for, questions arise as to whether motivation plays a different role in the online environment than it has in the traditional classroom environment.

**Self-regulated learning.** Findings reveal that self-regulated learning is positively related to students’ performance in their online courses, which is consistent with prior research (Artino, 2008; Barnard, La, To, Paton & Lai, 2009; Pintrich & De Groot, 1993; Zimmerman & Schunk, 2001). However, when the linear effects of academic self-efficacy and motivation are accounted for in the complex relationship between self-regulated learning and students’ performance, self-
regulated learning is no longer found to be significantly related to students’ performance, which is not consistent with prior research. Overall, empirical evidence indicates that self-regulated learning is a critical success factor for both online students (Artino, 2008; Barnard, La, To, Paton & Lai, 2009) and traditional classroom students (Pintrich & De Groot, 1993; Zimmerman & Schunk, 2001). Based on Pintrich’s social cognitive view of self-regulated learning and its emphasis on the importance of self-regulatory activities on learners’ achievements (Pintrich et al., 2000), you would expect that good self-regulatory skills would contribute to better academic performance, which was not the case in this study.

Because results from this study are not consistent with prior research (Artino, 2007; Hodges, 2005; Miltiadou & Savenye, 2003; Schunk & Zimmerman, 1998), it is important to consider factors that may have contributed to these discrepant findings. Specifically, it is important to consider why self-regulated learning is no longer found to be a significant contributor to academic success when the linear effects of motivation and academic self-efficacy are accounted for.

A major factor that may have contributed to the change in significance from the simple to complex relationship between self-regulated learning and students’ performance, is the same factor that likely contributed to the change in the direction of the relationship between students’ motivation and performance. As mentioned earlier, the linear effects of the other explanatory variables are accounted for when a complex relationship in a multiple regression is considered, whereas the linear effects are not accounted for in the simple correlational relationship (De Veaux, Velleman & Bock, 2009). Therefore, when the linear effects of motivation and academic self-efficacy are accounted for in the complex relationship in the multiple regression, the relationship between self-regulated learning and students’ performance is no longer significant.
because the regression coefficient is adjusted for the relationships between the other variables (Wampond & Freund, 1987).

In this study, self-regulated learning was not perfectly correlated with the other explanatory variables, academic self-efficacy and motivation. Therefore, each of these other variables added something unique to the students’ academic performance (Wampond & Freund, 1987). Based on this information it is reasonable to say that the change in significance from the simple to complex relationship between self-regulated learning and academic performance, is the result of the linear effects of academic self-efficacy and motivation being accounted for in the complex relationship.

Overall, evidence is not clear regarding the role of self-regulated learning on academic performance in the online classroom. However, being that prior research has not considered the role of self-regulated learning on students’ online performance while accounting for the linear effects of motivation and academic self-efficacy, it is possible that when these linear effects are accounted for, self-regulated learning is no longer important for student success.

Conclusion. Findings demonstrate that when the linear effects of all variables are accounted for in complex, real-life relationships between students’ academic performance in the online classroom, and their academic self-efficacy, motivation, and self-regulated learning, only academic self-efficacy is positively related to students’ academic performance, whereas motivation and self-regulated learning are not. Therefore Hypothesis 1, which states that students’ self-regulated learning skills, motivation level and academic self-efficacy positively influence academic performance in college online courses, is disproven.

Understanding interactions between and among academic performance, self-regulated learning, motivation, and academic self-efficacy. Results demonstrate that the three
2-way interactions of academic self-efficacy and motivation, self-regulated learning and motivation, academic self-efficacy and self-regulated learning, and the 3-way interaction of self-regulated learning, motivation and academic self-efficacy do not work together to impact students’ academic performance in the online classroom over and above the main effects of academic self-efficacy, motivation and self-regulated learning alone. Although results indicate that academic self-efficacy, motivation and self-regulated learning account for 43% of the variance in students’ grades, none of these constructs interact with each other to influence students’ academic performance.

Based on prior research (Artino, 2008; Barnard, La, To, Paton & Lai, 2009; Pintrich & De Groot, 1993; Zimmerman & Schunk, 2001) and Pintrich’s social cognitive framework (Pintrich et al., 2000), one would expect that self-regulated learning, motivation and academic self-efficacy would interact to influence students’ academic performance in the online classroom. However, results of this study contradict prior researcher which indicates that students who engage in self-regulated learning in the online classroom are more self-efficacious (Artino, 2007, Artino & Stephens, 2006; Schunk, 2005; Shen & Cho, 2013) and that students who use self-regulated learning strategies are more responsible for their own learning, more intrinsically oriented and more challengeable (Chang, 2005). Furthermore, research in the traditional classroom indicates that self-regulation is found to promote students’ learning and their perception of greater competence, which in turn sustains their motivation and self-regulating behavior to attain new goals (Pintrich, 2004; Pintrich & Zusho, 2002; Schunk & Zimmerman, 2008; Zimmerman & Schunk, 2003, 2011). Moreover, based on Pintrich’s social cognitive framework, you would expect that when students engage in self-regulation, they combine cognitive strategies with motivational beliefs (self-efficacy) for learning, goal orientation and
value (motivation), and interest (Pintrich, 2000; Zimmerman, 2000). These interactions, however, are not observed in this study.

Because the role of self-regulated learning, motivation, and academic self-efficacy are not fully understood in the online classroom and because results of this study contradict the extensive research in the traditional classroom (Pintrich, 2004; Pintrich & Zusho, 2002; Schunk & Zimmerman, 2008; Zimmerman & Schunk, 2003, 2011), which indicates that self-regulated learning, motivation and academic self-efficacy interact to influence student performance, results should be interpreted cautiously. Although no significant interactions were found between or among academic self-efficacy, motivation and self-regulated learning as was expected, this research is one of the first studies that investigates the interaction effects of academic self-efficacy, motivation and self-regulated learning on student performance in the online classroom.

**Conclusions.** Findings reveal that students’ academic performance in the online classroom is not influenced by interactions between or among academic self-efficacy, motivation and self-regulated learning. Therefore, results failed to prove hypotheses 2, 3, 4, and 5, which postulate that: (1) hypothesis 2, students who are both highly motivated and self-efficacious demonstrate greater academic performance in their college online courses than those student who are not motivated and self-efficacious, (2) hypothesis 3, students who are both highly motivated and who engage in self-regulated learning demonstrate greater academic performance in their college online courses than students who are not motivated or self-regulatory, (3) hypothesis 4, students who are both highly self-efficacious and who engage in self-regulated learning demonstrate greater academic performance in their college online courses than student who are not self-efficacious or self-regulatory, and (4) hypothesis 5, students who are highly motivated, self-efficacious and who engage in self-regulated learning demonstrate greater academic
performance in their college online courses than student who are not motivated, self-efficacious and self-regulatory.

**Limitations, Implications, and Future Research**

**Limitations.** Although this study advances the literature, there are several limitations that should be discussed. First, the modified post-test only design used in this study may have contributed to the surprising outcomes regarding the role of self-regulated learning and motivation on students’ performance. Because data was collected at the end of the college semester it is possible that students were not as highly motivated as they may have been earlier in the semester. Furthermore, students may not have been utilizing as many self-regulatory skills for the same reason. Therefore, it might be more telling if students’ motivation, self-regulated learning skills and academic self-efficacy were measured at mid-semester, as opposed to the end of the semester. Additionally, using a design that includes a mid-semester data collection would enable predictions to be made about the role of these constructs in online environment as opposed to an explanation of their role. The ability to make predictions would provide additional information about the importance of academic self-efficacy, self-regulated learning and motivation in predicting students’ success.

Second, the online courses used in this study were not randomly selected. Although all online faculty were asked to include their courses in this research study, only the courses of the faculty who volunteered the use of their online courses were used. Because random selection was not used to select the online course that would participate in this study, results may not generalize to the entire population. Third, there is a restriction of range in grades. Because 80% of the participants’ grades were within the A and B range, my ability to fully observe the differences in motivation, academic self-efficacy and self-regulation across the entire grade
distribution of A through F was hindered. Therefore, results generalize to those students that are better than average in their online courses.

Fourth, the sample is predominantly female. Because 89% of the participants were female, which is 10-20% higher than typical female enrollment in online research (Artino & Jones, 2012; Bell & Akroyd, 2006; Jost, Rude-Parkins & Githens, 2012; Puzziferro, 2008; Radovan, 2011; Sanson, Smith, Thonan & MacNamara, 2012; Secreto, 2013; Stewart, Bachman & Johnson, 2010), it is difficult to generalize results to both male and female students. Therefore, results generalize mainly to female students taking online college courses. Fifth, the three constructs that defined students’ motivation in this study should have been investigated separately as well as jointly. It is possible that among the three motivational constructs used to measure motivation in this study, such as internal goal orientation, external goal orientation and task value, some are more important to student performance in online courses than the others. Being that all three motivational constructs were used to determine students’ motivation level, this study did not capture whether one subcomponent of motivation was more important than the other.

Implications. Despite the existing limitations of the study, the findings of the study do have practical implications. Although results regarding the role of motivation and self-regulated learning need further research to better understand the role they play in the online classroom, valuable understanding regarding the role of academic self-efficacy was obtained in this present study. This information could be useful for online instructors when designing and instructing their online courses. Knowledge of the role of academic self-efficacy can provide online instructors with important information that can assist them in designing and conducting online courses that foster academic self-efficacy. There are many ways in which online instructors
could foster students’ academic self-efficacy. For example, courses could be designed to assist students achieve academic success by providing tasks and assignments that are attainable and challenging (Bandura, 1977), instructors could provide encouragement and in-depth, informative feedback (Bandura, 1977), and courses could be designed to include multiple forms of assessment which provides all student with the opportunity to be successful. In summation, by providing an online learning environment that fosters students’ beliefs in their abilities and what they can do, students’ learning and performance can be optimized.

**Future research.** This research provides new evidence regarding the role of academic self-efficacy, motivation and self-regulated learning in the college online environment. These findings suggest that academic self-efficacy is an important contributor to student success in the online classroom environment. Furthermore, results suggest that motivation and self-regulated may play a different role in the online classroom than they do in the traditional classroom. Therefore, there is a clear need for replication of this study to determine if in fact motivation and self-regulated learning play a different role in the online classroom.

Future research should more carefully investigate the role of motivation on students’ performance. Subsequent research should investigate the individual components of motivation, such as intrinsic goal orientation, extrinsic goal orientation and task value. This type of research could provide a better understanding of which motivational constructs are most important.

Research should be conducted using a one-group mid-test research design, in contrast to a modified one-group post-test only design. This method would include a mid-semester data collection, which would measure students’ motivation, self-regulated learning and academic self-efficacy mid-semester, and a posttest data collection at the end of the semester, which would include students’ final grades. This one-group mid-test design would be beneficial for three
reasons. First, because it would enable predictions to be made about the role of academic self-efficacy, motivation and self-regulated learning on students’ performance in the online classroom. Second, it would eliminate the possibility that students’ motivation and self-regulatory skills are not has high or meaningful at the end of the college semester because they are tired. Third, a one-group mid-test design would be a new approach to collecting this type of data in the online classroom because posttest designs are typically used. Based on this information, a one-group mid-test design would provide new and valuable information regarding the true predictive nature of self-regulated learning, motivation and academic self-efficacy.

Additionally, it would be beneficial to attract participants who are lower achieving students to ensure a good distribution of grades from A through F. Having a wider range of grades would allow for a better assessment of how students’ academic performance is influenced by self-regulated learning, motivation and academic self-efficacy. Lastly, it would be valuable to determine whether self-regulatory learning skills were necessary in online courses that are highly organized and structured and include very clear goals, deadlines and expectations that assist in regulating and controlling students’ behavior. If this was the case, online faculty would be able to design courses that would regulate students learning and behavior with the hope of optimizing their performance in their online courses.

Conclusions

The results of this study provide important evidence about the role of academic self-efficacy, motivation and self-regulated learning on students’ academic performance in the online classroom. Particularly important is the evidence related to the role of academic self-efficacy; the change in the relationships that occurred between students’ performance and their motivation level, and self-regulated learning when multiple student-related factors were considered at one
time, (i.e. motivation, self-regulated learning and academic self-efficacy), and the lack of interaction effects between and among student performance, and academic self-efficacy, motivation, and self-regulated learning.

Results revealed that academic self-efficacy is clearly associated with student’s academic success in online courses, both alone and when the linear effects of motivation and self-regulated learning are taken into account. However, this was not the case for self-regulated learning and motivation. After allowing for the linear effects of other student related factors, such as academic self-efficacy, motivation and self-regulated learning, students’ motivation became negatively related to their performance, while self-regulated learning developed a non-significant relationship with their performance. Furthermore, results show that self-regulated learning, motivation and academic self-efficacy do not interact to influence students’ performance but together they do account for 43% of the variation in students’ grades.

Overall, the findings of this study are meaningful and important because the role of academic self-efficacy, motivation, and self-regulated learning in the online environment is better understood. Additionally, this new understanding of the role of academic self-efficacy can guide online instructors when they design and conduct online courses to ensure that a learning environment is created to foster students’ academic self-efficacy. In turn, students’ learning and performance in these courses could be optimized.
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Appendix: Questionnaire

Demographic Information

1. What is your current grade in this course? Please identify the percentage – (e.g. 92%).

2. How many online courses have you taken PRIOR to this course?

3. Gender
   a. Male b. Female

4. What is your age?

5. Number of completed college credits prior to this semester?

Part A. Motivation

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

1  2  3  4  5  6  7

Not at all Very true

true of me of me

1. In a class like this, I prefer course material that really challenges me so I can learn new things.

2. If I study in appropriate ways, then I will be able to learn the material in this course.

3. I think I will be able to use what I learn in this course in other courses.

4. I believe I will receive an excellent grade in this class.

5. I'm certain I can understand the most difficult material presented in the readings for this course.
6. Getting a good grade in this class is the most satisfying thing for me right now.

7. It is my own fault if I don't learn the material in this course.

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

9. The most important thing for me right now is improving my overall grade point average, so my main concern in this class is getting a good grade.

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

11. If I can, I want to get better grades in this class than most of the other students.

12. I'm confident I can understand the most complex material presented by the instructor in this course.

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

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

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

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

17. I expect to do well in this class.

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

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

20. When I have the opportunity in this class, I choose course assignments that I can learn from even if they don't guarantee a good grade.

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

22. I like the subject matter of this course.

23. Understanding the subject matter of this course is very important to me.
24. I'm certain I can master the skills being taught in this class.

25. I want to do well in this class because it is important to show my ability to my family, friends, employer, or others.

26. Considering the difficulty of this course, the teacher, and my skills, I think I will do well in this class.

Part B. Learning Strategies

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

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27. When I study the readings for this course, I outline the material to help me organize my thoughts.

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

29. When I study for this course, I go through the readings and/or my notes and try to find the most important ideas.

30. I make good use of my study time for this course.

31. I make simple charts, diagrams, or tables to help me organize course material.

32. I find it hard to stick to a study schedule.
33. When I study for this course, I go over my class notes and make an outline of important concepts.

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

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

36. I log into this class regularly.

37. I often find that I don't spend very much time on this course because of other activities.

38. I rarely find time to review notes or readings before a quiz.

39. When reading my textbook and/or notes I often miss important points and have to re-read the information because I'm thinking of other things.

40. When reading for this course, I make up questions to help focus my reading.

41. When I become confused about something I'm reading for this class, I go back and try to figure it out.

42. I often feel so lazy or bored when I study and do work for this class that I quit before I finish what I planned to do.

43. If course readings are difficult to understand, I change the way I read the material.

44. I work hard to do well in this class even if I don't like what we are doing.

45. Before I study new course material thoroughly, I often skim it to see how it is organized.

46. I ask myself questions to make sure I understand the material I have been studying in this class.

47. I try to change the way I study and/or do work in order to fit the course requirements and the instructor's teaching style.

48. I often find that I have been reading for this class but don't know what it was all about.

49. When course work is difficult, I either give up or only study the easy parts.
50. I try to think through a topic and decide what I am supposed to learn from it rather than just reading it over when completing work for this course.

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

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

53. When I study for this class, I set goals for myself in order to direct my activities in each study period.

54. If I get confused when taking notes for this class, I make sure I sort it out afterwards.

Part C. Instructor Feedback

The following questions ask about the feedback you receive from your instructor in this course. Again, there are no right or wrong answers. Answer the questions about the feedback you receive from your instructor in this class as accurately as possible. Use the following scale to answer the remaining questions. If you think the statement is very true, choose/click 7; if a statement is not at all true, choose/click 1. If the statement is more or less true, find the number between 1 and 7 that best describes you.

1 2 3 4 5 6 7

Not at all True Very true

55. My instructor only verifies if the answers or responses to my assignments are correct or incorrect

56. My instructor tells me what the correct answers or responses are if I get them incorrect.
57. My instructor explains why my responses or answers are correct or incorrect or provides me with relevant information that will encourage me to reason and think about the correct responses or answers.

58. My instructor rarely gives me any feedback on my assignments.

59. My instructor never gives me feedback on my assignments.

60. My instructor responds quickly to my e-mails.