ABSTRACT

BELL, PAUL DAVID. Can Factors Related to Self-Regulated Learning and Epistemological Beliefs Predict Learning Achievement in Undergraduate Asynchronous Web-Based Courses? (Under the direction of Paul F. Bitting and Duane Akroyd.)

The purpose of this study was to examine the effects of subfactors of self-regulated learning (SRL) and epistemological beliefs (EB) on individual learner levels of academic achievement in an asynchronous Web-based learning environment while holding constant the effect of three covariate factors: (a) self-efficacy for using computer technology, (b) reason for taking an online course, and (c) prior college academic achievement. The study population was comprised of 201 undergraduate students enrolled in a variety of asynchronous Web-based courses during the spring 2005 semester at a university in the southeastern region of the United States.

Data was collected via a Web-based self-report questionnaire and subjected to the following analyses: (a) separate exploratory factor analyses were performed in order to determine the factor structures for the self-regulated learning and for the epistemological beliefs question items, (b) Pearson correlation coefficients describing the associations among the independent variables and between the independent variables and the dependent variable were compared, and lastly, (c) course grades were regressed on the linear combination of all the variables in the model.

Analysis of the data revealed that while 5 of 11 independent variables were associated with the dependent variable (GPA, Expectancy, Effort regulation, Quick learning and GPA_Exp); only three (GPA, Expectancy, and GPA_Exp) were significant predictors in the linear predictive model of learning achievement in asynchronous online courses.

Study findings were analyzed and reasons offered for why the predictive model of learning achievement in asynchronous online courses included only one self-regulated learning subfactor, no epistemological belief subfactors, and only one of the three covariate factors. Future research that looks at other factors affecting learner achievement and that employs other research methodologies, such as qualitative analysis, are warranted and would greatly add to the literature related to learning achievement in undergraduate asynchronous online environments.

CAN FACTORS RELATED TO SELF-REGULATED LEARNING AND EPISTEMOLOGICAL BELIEFS PREDICT LEARNING ACHIEVEMENT IN UNDERGRADUATE ASYNCHRONOUS WEB-BASED COURSES?

by

PAUL DAVID BELL

A dissertation submitted to the Graduate Fauclty of
North Carolina State University
in partial fulfillment of the
requirements for the Degree of
Doctor of Philosophy

EDUCATIONAL RESEARCH AND POLICY ANALYSIS

Raleigh, North Carolina

2006

APPROVED BY:

Robert C. Serow	Kenneth H. Brinson, Jr.
Paul F. Bitting Co-Chair of Advisory Committee	Duane Akroyd Co-Chair of Advisory Committee

DEDICATION

According to the Talmud there are three things one should do during one's lifetime in order to build an enduring legacy: plant a tree, have a child, and write a book. When I began this quest in pursuit of a doctoral degree, I was already a father and planter of several backyard trees. The publication of this dissertation completes the Talmudic prescription for building a personal legacy.

While it is, indeed, personally satisfying to see the fruit of my hard work and effort in print, its importance goes far beyond personal satisfaction. This work represents my legacy to my son, Jacob, in the form of this message: no matter what your life task, if you approach it with a healthy dose of expectancy for success, then you shall certainly succeed.

This opus is dedicated to my parents, Rhoda and Isidore, whose unconditional love, unwavering support, and thoughtful guidance helped inculcate a healthy sense of "expectancy" for much of what I have attempted in my life.

I am deeply grateful to the members of my advisory committee. Your guidance and support helped bring my expectancy for learning to fruition.

BIOGRAPHY

Bachelor of Arts, French and Spanish, State University of New York at Albany, 1974.

Master of Science, Teaching English as a Second Language, State University of New York at Albany, 1976.

Post-Baccalaureate Certificate, Medical Records Administration, Health Science Center at Brooklyn,1989.

Currently employed as an associate professor of health information management in the School of Allied Health Sciences at East Carolina University.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER I: INTRODUCTION

Increasingly, public institutions of higher learning are adding asynchronous Web-based instruction to their undergraduate degree programs. Although online learning has been hailed as the next revolution in access to higher education, the reality is that many undergraduate learners (late adolescent students between the ages of 18 and 25 years of age) who function well in traditional on-campus classrooms are not likely to be ready for the demands of asynchronous Web-based learning (AWBL). This reality is based on the fact that online learning requires more learner control and self direction than traditional classroom-based instruction. For example, online students must be able to self motivate, self manage and self assess their own learning. These abilities are representative of higher levels of intellectual development that "may well be unattainable during the late adolescent years" (Turnbull, 2003, p. 79). The college learning experience represents, for most students, the first time that they generally must take more responsibility for and control of their academic learning (Perry, 2001; Thompson & Geren, 2002). Asynchronous Web-based learning, which is not tied to a specific place and time, involves higher intellectual abilities as well as increased levels of independence that late adolescent college students are not likely to be prepared to assume.

Asynchronous Web-Based Learning: Learner Controlled

Asynchronous Web-based learning (AWBL) occurs in cyberspace—the learning environment hosted by the Internet. This virtual learning environment can be accessed anytime and anywhere so long as learners have a computerized device that connects them to the Internet. Besides not being bound by physical and chronological boundaries, asynchronous online learning environments generally include hypermedia links that present information in a more nonlinear manner than in traditional classroom-based settings. With the ability to activate hyperlinks at will, learners have more control over what information they access and how instructional materials and activities are sequenced and delivered.

Traditional undergraduate classroom-based learning is generally characterized by a one-way flow of information and communication from teacher to student. On the other hand, AWBL environments normally include opportunities for learners to communicate and interact in cyberspace. Such a learning environment is said to be more constructive or learner-centered in nature. Furthermore, Swan, Fredericksen, Pickett, Petz, & Maher (2000) have characterized AWBLs as true knowledge-building communities in which learners construct their knowledge regarding a particular topic by utilizing the content included on the course Web site as well as the information shared via communication technologies such as discussion boards.

Finally, most asynchronous Web-based learning environments include online assessments that give immediate feedback to learners regarding their learning progress. Armed with such information, learners can monitor their learning progress in the asynchronous online course.

Therefore, AWBL requires learners to control their learning by deciding when and where they will access the course and whether they will click on hyperlinks, initiate or respond via interactive communication technologies, or monitor their progress in the course (Anderson, 2000; McManus, 2000; Olgren, 1999; Swan et al., 2000; Williams and Hellman, 2004; Wolfe, 2000).

The literature suggests that successful online learning demands more than cognitive attributes but also what Snow (1989) referred to as conative or goal-oriented factors that drive behavior. There is little research within the area of asynchronous online learning that examines the relationship between such factors and successful learning in AWBL environments. For the most part, investigations have focused on the comparisons between on-campus classrooms and online course “rooms”; however, researchers are turning their attention toward educational psychology and the question of how learner characteristics influence learning in a Web-based instructional environment (Diaz, 2000; Hartley & Bendixen, 2001; Lockee, Moore, & Burton, 2001).

Educational Psychology: Learner Characteristics and Academic Success

Recent research in educational psychology has identified two characteristics that appear to be related to academic success in environments requiring more learner control and self-monitoring. These characteristics are self-regulation of learning and epistemological beliefs about knowing and learning (Eom & Reiser, 2000; Hartley & Bendixen, 2001; Kember, 2001; Young, 1996). Educational psychologists have described self-regulation of learning and epistemological beliefs as important characteristics that may positively influence academic performance (Garavilia & Gredler, 2002; Hartley & Bendixen, 2001; Pintrich, Smith, Garcia, & McKeachie, 1991; Wolters, Pintrich, & Karabenick, 2003; Zimmerman, 1990). Previous studies with college students in traditional classroom-based learning environments have shown that learners who possessed higher scores on various factors related to self-regulation earned either final course grades or task performance scores that tended to be higher than other learners (Bouffard-Bouchard, 1993; Ertmer & Newby, 1996; Garavilia & Gredler, 2002; Isaacson & Fujita, 2001; McManus, 2000). Although these study results were statistically significant, they usually tended to be moderate in magnitude.

Similarly, there is evidence to support the notion that college student academic performance, as measured by grade-point average (GPA), is correlated with certain epistemological beliefs about knowledge and learning (Hofer, 2002; Peng, 2003; Schommer, 1993b) and that individuals who hold these beliefs tend to achieve at a statistically higher rate than other learners. Again, the results generated by these studies were moderate in the magnitude of their effect. The next two sections will present an overview of the two constructs of self-regulated learning and epistemological beliefs.

Self-Regulated Learning

Self-regulated learning (SRL) is an element of social cognitive learning theory that states that learner behaviors and motivations as well as aspects of the learning environment affect learner achievement (Bandura, 1986; Omrod, 1999; Zimmerman, 1998). Previous theoretical research about traditional classroom-based settings indicates that setting learning goals, monitoring one's progress towards meeting those goals, and managing various learning resources such as time and place are important aspects of self-regulated learning theory (Boekarts, Pintrich, & Zeidner, 2000; Pajares, 2002; Pintrich, 2000; Pintrich, Smith, Garcia, & McKeachie, 1991; Thompson & Geren, 2002). It has been argued that self-regulation of learning (SRL) has a positive influence on academic success (Garavilia & Gredler, 2002; Pintrich & DeGroot, 1990; Pressley & Ghatala, 1990; Schunk, 1994; Williams & Hellman, 1998). For example, Lan (1998) found that students enrolled in a statistics course who used certain self-monitoring behaviors tended to score higher on course content examinations. Finally, Williams and Hellman (1998) found that self-regulation was significantly correlated with grade-point average among first generation community college students. Academic success in these and other studies was measured in a variety of ways including grade point average (GPA), performance on course examinations (Lan, 1998), and successful course completion with at least a grade of “C” (Zimmerman, 2002).

Expanding the research on self-regulated learning (SRL) into the area of Web-based learning makes sense as more learner choice is allowed in online instruction. This is because a learning environment that includes learner choice encourages self-regulation (Schunk & Zimmerman, 1996).

Learner choice also implies learner control. Because asynchronous Web-based learning environments allow for more learner control than do traditional classroom-based environments, learner self-regulation may be more crucial to academic success in online courses. For example, investigative studies from the instructional technology design branch of the online learning literature suggest that students who are high self-regulators tend to achieve at higher rates in learner-controlled online environments than do low self-regulators (Joo, Bong, & Choi, 2000; Land & Greene, 2000; McManus, 2000; Young, 1996). Despite these findings, there have been mixed results concerning level of learner self-regulated learning and learning achievement in AWBL courses. In addition to self-regulated learning, there has been some limited evidence that certain epistemological beliefs about knowledge and learning can also affect learning and achievement (Bendixen & Hartley, 2003; Chan, 2003; Paulsen & Feldman, 1999).

Epistemological Beliefs

Epistemological beliefs (EB) are beliefs held by individuals about knowledge and learning. The study of these beliefs also includes how people come to know and how their beliefs regarding knowledge and learning influence the cognitive process (Hofer , 2002).

Educators have been interested in epistemological beliefs since Perry's (1970) seminal work on this subject. According to Perry and other theorists, individuals pass through a predictable sequence of epistemological growth. Thus, students' epistemological beliefs develop from a simplistic view of knowledge and reasoning to a more complex one that includes the ability to evaluate different viewpoints. Educational researchers have theorized that the more sophisticated one's beliefs are about knowledge and learning, the more successful she should be in thinking and problem solving (Bendixen & Hartley, 2003; Hofer, 2002; Schommer, 1990).

Empirical research conducted with learners in traditional classroom-based settings has tended to support this view of epistemology. For example, students with naïve or immature views concerning learning and knowing tend to score lower on academic tasks such as reading comprehension and mathematical problem solving than other learners who are characterized as more sophisticated in their epistemological beliefs (Bendixen & Hartley, 2003; Hofer, 2002; Peng, 2003; Schoenfeld, 1983; Schommer, 1990; Schommer, Crouse, & Rhodes 1992).

Asynchronous Web-based courses occur in virtual learning environments, and, as such, place more responsibility on individual learners for controlling and monitoring their navigation and learning in the course. As a result, some have argued that students with more sophisticated epistemological beliefs should succeed at a higher rate than other students who are learning in the same environment (Anderson, 2000; Bendixen & Hartley, 2003; Dillon & Gabbard, 1998; Land & Greene, 2000; Peng, 2003). However, there have been relatively few studies that have demonstrated this proposed effect of epistemological beliefs on learning with asynchronous online courses (Bendixen & Hartley, 2003; Dillon & Gabbard, 1998;

Jacobson & Spiro, 1995; Peng, 2003). As a consequence, more research is needed in order to demonstrate the relationship between epistemological beliefs (EB) and learner performance in asynchronous Web-based learning environments. By closely examining the deficiencies in the research on EB and the deficiencies in the research on SRL, a plan was developed to address these weaknesses in the current study.

State of Research on Self-Regulated Learning and Epistemological Beliefs

The research literature for each genre (SRL and EB) is characterized by mostly theoretical work that has made convincing arguments for why each construct should influence learner achievement. However, the empirical studies that have been conducted in both traditional classroom and computer-based settings have yielded limited results concerning the effects of either SRL or EB on student achievement.

These limited results may be because the majority of such research has examined each construct (SRL and EB) separately from the other. It is possible that a greater effect between the independent variables (SRL and EB) and the dependent variable of learner achievement can be realized if both constructs are included in the same study. Flavell (1979) and Hofer (2001) argued that self-regulated individuals who actively self-monitor their learning also tend to have sophisticated beliefs about knowledge and learning. Therefore, one would expect that combining an individual's level of self-regulated learning with his epistemological belief profile might be more effective in predicting learner performance than relying on either measure alone.

In addition to the lack of research that combines both SRL and EB in the same study of learner achievement, there are two other shortcomings that characterize the research related to SRL and EB. These deficiencies are methodological in nature.

First, most of the investigative studies dealing with the genres of self-regulated learning and epistemological beliefs have looked at small samples of undergraduate learners from a very limited number of academic disciplines. These studies have tended to be restricted to small samples of students from the undergraduate disciplines of education and information technology (Bendixen & Hartley, 2003; Chen, 2002; Garavilia & Gredler, 2002; Joo, Bong & Choi, 2000; McManus, 2000; Peng, 2003; Schommer, 1993a; Young, 1996). Moreover, a search of the literature uncovered only one study in the area of SRL that looked at a large sample of undergraduates from a public four-year institution. However, that study compared two groups of students' capacity for self-regulation and did not look at the effect of SRL on learner academic performance (Williams, 2004). Additionally, only one study from the genre of EB examined a large sample of college undergraduates from different academic disciplines (Schommer-Aikens, Duell, & Baker, 2003). However, that particular study compared the EB of these students without attempting to correlate their EB with learning achievement as measured by final course grade.

Second, most empirical studies related to the genres of SRL and EB have been primarily concerned with demonstrating that individual subfactors of SRL or EB correlate with learner achievement. Consequently, each research area has relied heavily on bivariate correlational studies in order to demonstrate this relationship (Eshel & Kohavi, 2003; McManus, 1995, 2000; Miller, 2000; Pintrich, Smith, Garcia, & McKeachie, 1991; Schommer-Aikens, 2002; Wolters, Pintrich & Karabenick, 2003). While this sort of research design is adequate for revealing relationships between single-independent and single-dependent variables, it cannot show how well multiple-independent variables together can predict a response variable. In addition, bivariate correlation cannot produce an equation that gives a predicted value of the dependent variable from the values of the independent variables (in this case multiple factors of SRL and EB and final course grade).

On the other hand, multiple regression analysis determines how well a set of predictors jointly predict the value of a response variable and provides an equation for the predicted value. This outcome is significant because learner achievement is a complex phenomenon affected by different factors. Such complex relationships among variables can be best described by using predictive modeling or linear regression models (Cohen & Cohen, 1983). Moreover, predictive modeling techniques can also control for the influence of certain covariate factors on the proposed model. Unfortunately, the literature from these research genres contains few examples of such studies.

The handful of studies that employed predictive models to describe the relationship between learner achievement and SRL factors or between learning achievement and EB factors differed as to the covariates that they chose to include in their models. While the researchers are to be commended for using linear regression models in their studies, these models can also be critiqued based on the particular factors chosen as covariates in the model design (Chen, 2002; Bendixen & Hartley, 2003; Garavilia & Gredler, 2002; Peng, 2003). This issue of research methodology will be addressed in more detail in the chapter two literature review and again in the chapter three discussion of the research design for the current study.

Previous empirical research in SRL and EBI has yielded mixed results concerning the relationship between these attributes and learning achievement. This is to say that prior studies had shown associations between some of the subfactors but not between others. Therefore, this study will identify those subfactors of SRL and EB that are related to final course grade for a sample of undergraduates enrolled in asynchronous Web-based courses at a southeastern university. These subfactors will then be included in a linear model that seeks to predict learning achievement in Web-based courses.

In summary, the research literature on self-regulated learning and epistemological beliefs is rich in arguments for establishing the importance of these factors for academic success. However, literature that provides evidence for how these factors can contribute to a predictive model of learning achievement in asynchronous Web-based learning environments is scarce. The next phase of research requires a theoretical framework for understanding how the factors of SRL and EB interact to affect academic success.

Theoretical Framework: Predicting Online Learner Achievement

Social cognitive and constructive learning theories are useful orientational models from which to develop a theoretical perspective for understanding the effect of self-regulation of learning and beliefs about knowledge and learning (epistemological beliefs) on learner achievement in asynchronous Web-based environments. Therefore, it is appropriate to review some of these theories and how they relate to this present study.

Social Cognitive Learning Theory and Self-Regulating Learning Factors

Cognitive learning theory emphasizes the role played by the individual in determining his success in learning and achievement (Ormrod, 1999). Among individual attributes that influence learning performance are self-regulated learning and epistemological beliefs about knowledge and learning (Hartley & Bendixen, 2001). More significantly, recent investigators have proposed that these factors may be important variables in explaining academic performance in learner-centered environments such as asynchronous online courses (Hartley & Bendixen, 2001; Schommer, 1990; Peng, 2003; Williams & Hellman, 2004).

Self-regulated learning is a central concept in social cognitive learning theory. It is comprised of discrete factors that describe student motivation and the use of certain learning strategies. The assumption is that students who display certain motivations and use specific strategies in their learning will be more successful learners than other students who do not use such strategies. A review of the theoretical research in SRL shows that individuals must display certain fundamental attributes in order to be successful self-regulators of their learning. These attributes include: (a) being intrinsically motivated to reach goals, (b) expecting that one's efforts to learn will result in positive outcomes, (c) being confident in one's ability to perform and complete an academic task, (d) monitoring one's progress toward goal completion, (e) controlling one's effort and attention, and (f) managing time and place resources for learning and studying. Self-regulated learning theory argues that these conditions must be present before students can successfully employ cognitive strategies in their learning. Therefore, this study will focus only on the factors of self-regulated learning that are related to the attributes listed above (see Figure 1).

These specific self-regulated learning factors include intrinsic goal orientation, expectancy-control of learning, self-efficacy for learning and performance, self-efficacy for monitoring one's learning progress, control of effort and attention, and management of time and place resources for learning and studying (Hofer, Yu, & Pintrich, 1998; Pintrich, Smith, McKeachie, & Garcia, 1991; Zimmerman, 2000). Because they have managed to create internal and external conditions that facilitate self-regulation of learning, students who have high levels of these SRL factors should be more successful academically than students who have lower levels of these factors.

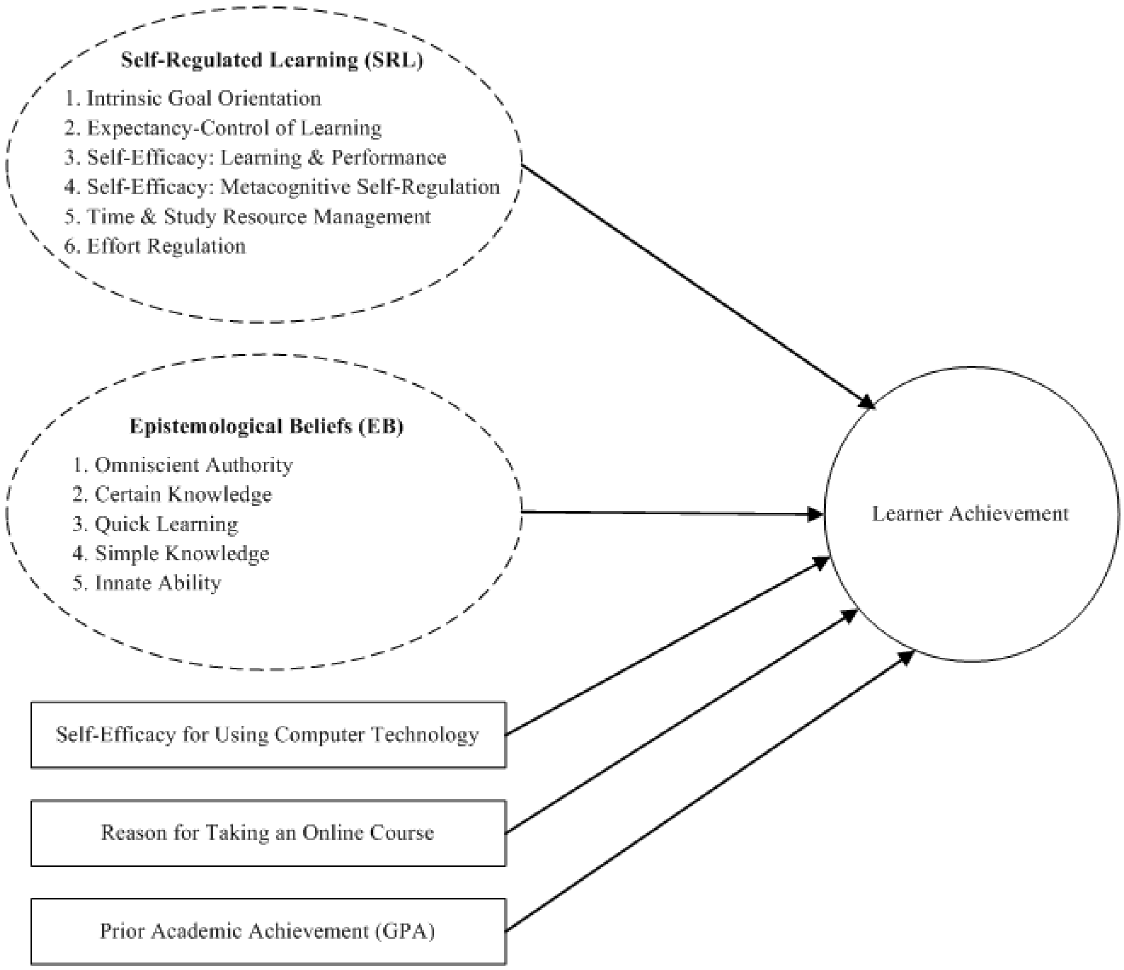


Figure 1. Proposed factors that predict learner achievement in an asynchronous Web-based course.

Constructivist Learning Theory and Epistemological Belief Factors

In addition to social cognitive learning theory, constructivist learning theory provides a framework in which to understand how epistemological beliefs may influence a learner's academic performance. Epistemology refers to how people learn and to the nature of knowledge (von Glasersfeld, 1989). Constructivist learning theory emphasizes the influence that prior experience, attitudes and motivation have on learner performance in current learning situations. Personal epistemological beliefs form a part of this previous experience.

Research concerning learners' beliefs and attitudes about learning and knowledge has demonstrated that epistemological beliefs may help to explain why some learners are more likely to achieve academically than others (Bendixen & Hartley, 2003; Peng, 2003; Perry, 1970; Schommer, 1990). Schommer (1990) and Bendixen and Hartley (2003) proposed that students who succeed academically should be more sophisticated than less-successful students on the following dimensions of epistemological beliefs: (a) omniscient authority, (b) certain knowledge, (c) quick learning, (d) simple knowledge, and (e) innate ability (see Figure 1). According to the theoretical rubric of epistemological beliefs, a sophisticated learner would believe that not all knowledge is absolute or certain. Such a learner does not believe that knowledge is simply a collection of discrete facts. She would, furthermore, be more inclined to not only research information on her own rather than wait to receive it from an authority, such as a teacher or instructor, but to also verify knowledge received in class by searching for it in a reference text or on the Internet. She would also tend to view learning as a process that requires work and/or study and, as a result, believe that the process of learning helps her to become a more effective learner. Thus, according to the literature on learning and epistemological beliefs, such a learner would be more likely to achieve at a higher rate of academic achievement than other learners with less sophisticated beliefs and attitudes about knowledge and learning (Bendixen & Hartley, 2003; Perry, 1970; Schommer, 1990, 1998).

According to Flavell (1979) and Hofer (2001), students with sophisticated notions about knowledge and learning should also display high levels of self-regulated learning. This suggests that a student's achievement may be affected by both his level of self-regulated learning and epistemological beliefs.

Academic Achievement: Other Factors

In addition to the principal independent variables that are the focus of this study (subfactors of self-regulated learning and epistemological beliefs). other factors have been shown to affect achievement in asynchronous Web-based instructional settings. These factors include self-efficacy for computer technology use, reason for taking an online course, and prior college academic achievement.

Previous empirical research related to online courses has demonstrated that the reason why a student chooses to take an online course is associated with success in learning in that medium. Collins and Pascarella (2003), Roblyer (1999), and Wang and Newlin (2002b) have all demonstrated that learners who take online courses because they prefer them to classroom-based courses or because they are curious to experience online instruction obtain higher grades than those who take online courses by default because they have no other option. This makes intuitive sense because it is to be expected that individuals who actively choose the medium for their learning are more motivated to learn in that medium than other individuals who find themselves involuntarily placed in that learning medium. As a result, those individuals choosing online learning because of preference or curiosity are more motivated to learn and should earn greater final course grades than their online counterparts. Therefore, a variable called “reason for taking the course” was included in the model for predicting achievement in online courses (see Figure 1).

In addition to the reason for learning online, self-efficacy or confidence in one’s ability to use computer technology is another important factor identified as crucial to achievement in Web-based courses. Being able to use the technology that comprises Web-based learning is as critical to academic success as are reading and writing skills for learning in online environments. Wang and Newlin (2002a) and Joo, Bong and Choi (2000) have clearly demonstrated in their studies that students who self describe as confident in their ability to use computer technology such as the Internet, e-chat or e-mail are more likely to succeed in online learning than are other students who are less confident in their use of this technology. Therefore, a variable labeled "self-efficacy for using computer technology" was added to the predictive model (see Figure 1).

Previous studies regarding the determinants of academic achievement in college have generally included measures of prior and current academic achievement such as grade point average (GPA) (Bendixen & Hartley, 2003; DeAngelis, 2003; Garavilia & Gredler, 2002; Ishitani, 2003; Naumann, Bandolos, & Gutkin, 2003). Furthermore, according to the college board, after the first year, college GPA is the best predictor of further success in college. (Camara & Echternacht, 2000) It is particularly important to include academic achievement (as measured by GPA) in a study that seeks to understand the role played by self-regulated learning on achievement because there is evidence to suggest that individuals with prior academic success are more likely to self-regulate their learning than others. This is because prior academic success influences self-efficacy, an important component of self-regulation (Boekarts, Pintrich, & Zeidner, 2000; Bandura, 1986). Therefore, a variable labeled "prior academic achievement" was added to the predictive model (see Figure 1).

The underlying conceptual framework guiding the design and development of this study is based on the following premise: Individuals who self-regulate their learning, possess certain sophisticated ideas about knowledge and learning (epistemological beliefs), actively choose to learn online, and are self-confident regarding their use of computer technology should achieve at higher rates in a Web-based learning environment than others who do not demonstrate these characteristics and behaviors.

Purpose of Current Study

There are relatively few studies that have used predictive modeling in order to explain the affect of self-regulated learning (SRL) and epistemological beliefs (EB) on learner achievement in asynchronous Web-based environments. Most studies in this area have looked at either SRL or EB but not both in the same model. In addition, these investigations have varied in the number and types of covariate factors included in the final models. The purpose of the proposed study is to examine the affects of SRL and EB on individual levels of academic achievement in an asynchronous Web-based learning environment while controlling for the effects of three covariate factors: (a) reason for taking an online course, (b) self-efficacy for using computer technology, and (c) prior academic achievement as measured by college GPA.

Significance of the Study

A study that investigates the relationship between SRL factors, dimensions of EB, and learner achievement is significant because of its potential to impact the field of cognitive psychology, which impacts both on-campus and online instructional environments.

First, such a study can make valuable contributions specific to theoretical constructs for learner characteristics. Studying a large sample of undergraduate students from a wide variety of academic disciplines can provide useful information about how undergraduate students compare in their levels of self-regulated learning and their beliefs about knowing and learning. This information can help further develop theoretical frameworks in educational psychology that can inform instructional methodologies in both the traditional classroom and the online course room.

This research study can contribute to undergraduate educational and teaching practice by informing educators about how student characteristics such as level of self-regulated learning and epistemological beliefs may be correlated with learning achievement. Hofer, Yu & Pintrich (1998) proposed that SRL may be a teachable skill. Schommer (1998) and Peng (2003) suggested that teachers can be effective models of appropriate EB. Consequently, this study can help practitioners reflect on those SRL factors that learners need for successful learning. Also, research in this area can result in the development of learner inventories that can be used in course pretests to identify individual strengths and weaknesses concerning SRL and EB. Equipped with such information, instructional designers and educators can discover the best means to design and deliver instructional content that helps learners develop these attributes. Moreover, knowing an individual student's SRL and EB profile may help in counseling learners to choose the best instructional platform for courses—online or face-to-face versions.

Second, specific to Web-based learning, this study helps redirect the emphasis in online learning research from comparative studies of face-to-face and distance learning to learner-centered studies that can generate practical applications for academic success in the online environment. This shift in research focus is consistent with current directions indicated in the literature (Diaz, 2000; Hartley & Bendixen, 2001; Lockee, Moore, & Burton, 2001). Such research can help increase what is known about the influence of predisposing learner characteristics on learning in environments that oblige learners to control and monitor their learning. Finally, results from this study can provide a basis for potential avenues of future research into learner characteristics and their relationships to success in online learning

Last and perhaps most significant is this research study's potential for informing policy decisions related to the adoption and implementation of asynchronous Web-based courses, curricula, and even degree-granting undergraduate academic programs. Budget resources for public institutions of higher education are shrinking at a time when enrollments in college undergraduate courses and programs are soaring. There are those who argue that, given this predicament, it makes sense for colleges and universities to develop and promote online distance education (DE) as a means for expanding access to higher education while holding down associated costs (Jones, 2003). For example, AWBL would allow an institution to expand its customer (learner) base without making a substantial commitment of capital expenditures on construction of classrooms and other facilities normally needed to accommodate a larger on-campus population of learners. Attrition rates, however, from online asynchronous courses have been cited by the literature as higher than that for classroom-based college courses (Carr, 2000; Diaz, 2002; Parker, 1999; Phipps & Merisotis, 1999). These high attrition rates may reflect students' choices to drop Web-based courses once they determine that learning in an asynchronous online environment is different from classroom-based courses. Some students simply may not be prepared to learn in an asynchronous online environment. The results of this study may show that not all students are prepared to assume roles as self-directed and self-monitoring learners nor that all students share sophisticated notions about knowledge and learning. This information would be useful for those who set policy regarding the adoption of virtual media as replacements for traditional classroom-based learning.

Statement of the Problem

This researcher identified six factors of self-regulated learning (intrinsic goal orientation, expectancy or control of learning, self-efficacy for learning and performance, metacognitive self-regulation, time and study resource management, and effort regulation) and five factors of epistemological beliefs (omniscient authority, certain knowledge, quick learning, simple knowledge, and innate ability) among a sample of undergraduate students enrolled in asynchronous Web-based courses at a southeastern university and analyzed whether these factors are related to learner achievement. The aim was to develop a model for predicting learner achievement in undergraduate asynchronous Web-based courses that can: (a) aid counselors in providing guidance for learners regarding the instructional platform (face-to-face or online) best suited to their learning characteristics, (b) aid subject matter experts and instructional designers in designing Web-based instruction focused on developing the attributes of self-regulated learning and epistemological beliefs, and (c) aid instructors in meeting the needs of individual learners through remediation.

Research Question

The general question driving this study was: Are there subfactors of self-regulation and epistemological beliefs that can predict learner achievement in undergraduate asynchronous Web-based courses at institutions of higher learning? Given that each of the study's main constructs (self-regulated learning and epistemological beliefs) was composed of specific subfactors and that additional factors were proposed as predcitors of learning achievement in asynchronous Web-based learning environments, the general question was made more specific as follows: What is the predictive ability of self-regulated learning (intrinsic goal orientation, expectancy or control of learning, self-efficacy for learning and performance, metacognitive self-regulation, time and study resource management, and effort regulation); epistemological beliefs (omniscient authority, certain knowledge, quick learning, simple knowledge, and innate ability); computer self-efficacy, reason for taking an online course and prior academic achievement (GPA) on final grade in asynchronous undergraduate online college courses.

Assumptions

The first assumption was that asynchronous Web-based learning will continue as a delivery mode of instruction in institutions of higher learning at the undergraduate level. The second assumption was that the randomly-selected research subjects were representative of the undergraduate population of students who enroll in asynchronous Web-based courses. The third assumption was that the research subjects would participate in all activities and instructional assignments included in their online courses. The fourth assumption was that the research subjects would respond as accurately as possible to the survey instrument according to the instructions provided.

Study Limitations

The potential limitation of this study had to do with the generalizability of results. The subjects of this study were undergraduates enrolled in a variety of asynchronous online courses at a public four-year institution in the southeast region of the United States. The results of this study might be dependent, therefore, on the online interface and the participants. Interpretation of the results were limited to the context of this study.

Definition of Terms

Several terms are unique in the study. The following terms are defined to convey the meaning and the operational definition that is given to them.

Asynchronous Web-based (online) learning: Learning in which learners use computer and communications technologies to work with remote learning resources, including instructors and other learners, but without the requirement to be online at the same time (Asynchronous Learning Networks, n.d.).

Cyberspace: The term currently used to describe the whole range of information resources available through computer networks and the World Wide Web (Enzer, 2004).

Distance education (DE): Distance education is planned learning that normally occurs in a different place from teaching and, as a result, requires special techniques of course design, special instructional techniques, special methods of communication by electronic and other technology, as well as special organizational and administrative arrangements (Distance Education Clearinghouse, n.d.).

Epistemological beliefs (EB): EB refers to beliefs about the nature of knowledge and knowing (Hofer & Pintrich, 1997). Schommer (1990) proposed five independent epistemological dimensions corresponding to beliefs about knowledge. Each dimension is based on a continuum. The following lists the naïve end of the continuum for each dimension: (a) certain knowledge (i.e., absolute knowledge exists and will eventually be known, (b) simple knowledge (i.e., knowledge consists of discrete facts), (c) omniscient authority (i.e., authorities have access to otherwise inaccessible knowledge), (d) quick learning (i.e., learning occurs in a quick or not-at-all fashion, and (e) innate ability (i.e., the ability to acquire knowledge is static).

Self-regulated learning (SRL): SRL is a learning process in which self-generated thoughts, feelings, and actions are systematically oriented towards the attainment of the student's own goals (Zimmerman, 1989a).

Virtual media: Formats for communications that are hosted on the Internet and World Wide Web. Media can consist of text, images, audio or a combination of all three.

Web-based or online distance learning: any type of education that occurs while location, time, or both separate the participants. Learning occurs entirely via the Internet.

Organization of the Study

Chapter one introduces the background to the proposed study. Its purpose is to establish the importance of student characteristics such as self-regulated learning and epistemological beliefs in affecting student achievement in undergraduate asynchronous online courses. This chapter lays out the theoretical framework for the study, presents the research questions to be answered, and explains the purpose and the significance of the study. Lastly, it identifies the assumptions, limitations and definition of terms associated with the study. Chapter two is a review of the literature related to the study's theoretical model. Chapter three presents the proposed methodology this researcher used to conduct the study. Chapter four reports the research, and chapter five includes a discussion of the results of the study and includes recommendations for future research.

CHAPTER II: LITERATURE REVIEW

Introduction

This literature review covers both the theoretical and empirical bases for the proposed research study. The chapter is divided up into six major categories of literature related to the following: (a) the asynchronous learning environment, (b) self-regulated learning (SRL), (c) epistemological beliefs (EB), (d) support for combining SRL and EB in research on learning, (e) other predictors of achievement in asynchronous Web-based learning (AWBL) environments, and (f) designing a predictive model of learning for an AWBL environment. Based on this review, the chapter concludes with suggestions for addressing deficiencies in the research on learner achievement in AWBL environments.

The Asynchronous Learning Environment

In this study, learning occurred in an asynchronous Web-based environment. The latest National Center for Education Statistics (NCES) survey of post-secondary education reported that 56% of public four-year institutions of higher learning offered either courses, programs, or degree programs via Internet-based distance learning formats during the 2000-2001 academic year. The survey also reported that the predominant electronic medium for the delivery of learning at these institutions was via asynchronous Web-based learning environments (NCES, 2003).

Asynchronous Web-based learning (AWBL) environments usually do not include formal lectures from instructors. Instead, materials are presented through text-based and multimedia programs. Students are frequently expected to carry out much of their learning on their own, often separated in space and time from the instructor and other learners. Online instruction allows a minimum of two choices that traditional classroom-based instruction does not: where to study and when to study (Anderson, 1997; Hardless, Lundlin, & Nulden, 2001; Spiceland, 2002; Williams & Hellman, 2004). In addition, AWBL has been associated with constructivist learning methods in which the instructor functions more as a capable peer/facilitator than as a teacher in order to assist learners as they actively negotiate an understanding of curricular content (Nanjappa & Grant, 2003; Rovai, 2003; Vygotsky, 1978). This peer instructor/facilitator approach represents a novel experience for most college students whose prior educational schooling experiences consisted of learning in a teacher-controlled environment. These students are accustomed to having the instructor be the authority, providing information and articulating the appropriate interpretation of the information (Thompson & Geren, 2002; Travers, 2000). On the other hand, asynchronous Web-based environments are built in such a way as to place control for learning in the hands of the learner. Unlike traditional classroom settings, effective AWBL requires that all participants be active learners who collaborate in and communicate about their learning (Rovai, 2003; Swan, et al. 2000).

AWBL students are expected to interact or communicate with fellow learners and with the instructor/facilitator through written postings usually by e-mail and electronic bulletin boards (Anderson, 1997; Sloan Consortium, 2003a, 2003b). Thus, in asynchronous online learning, a group of people with a common objective or interest participate in online discussion forums as a means of learning from one another (Hew & Cheung, 2003).

AWBL is also characterized by online assessments such as quizzes and exams. Students can take these assessments and receive immediate feedback on their performance. As a result, learners can monitor and self-assess their progress while they are learning in the course (Anderson, 2000; Rosenberg, 2001; Wolfe 2000).

Aysnchronous Web-Based Learning Research

The majority of the research concerning the effectiveness of asynchronous online learning has been dubbed "media comparison studies." This genre of research is based on the indication that there is no significant difference between average final course grades for learners in online versus classroom-based versions of the same course. The assumption is that this lack of difference in final grades demonstrates that online learning is an effective modality for learning for all learners (Bell, 2001; Hadidi & Sung, 2000; McFarland, 1998; Russell, 1999;).

Despite the finding of "no significant difference," there are those who argue that media comparison studies are inappropriate for establishing the effectiveness of asynchronous online environments for learning because they fail to consider the role played by individual learner characteristics in affecting achievement in asynchronous Web-based learning (Diaz, 2002; Hartley & Bendixen, 2001; Phipps & Merisotis, 1999). For example, in a 1999 review of contemporary research on the effectiveness of online learning in higher education, Phipps and Merisotis noted that there are gaps in the online learning research literature because it is not clear whether online learning works for all students. As a result, they called for more research regarding those factors that influence student achievement in online learning environments (Phipps & Merisotis, 1999). Furthermore, Diaz (2002) concluded that comparing modalities of learning is fruitless and suggested that research efforts in the digital age should, instead, focus on the learner and try to discern "what student characteristics facilitate success in a particular learning modality" (Diaz, 2000, p. 3).

Various models of tele-learning place more responsibility for learning on students. As a result, it is assumed that those who can self-direct and control their learning will tend to achieve at higher rates compared to those who do not (Lee, 2002; McManus, 2000; Olgren, 1998; Young, 1996). Success in asynchronous Web-based learning environments, therefore, may be influenced by factors related to an individual's ability to regulate and control her own learning (Ertmer & Newby, 1996; Wang & Newlin, 2002a, 2002b; Williams & Hellman, 2004). Educational psychology research describes the ability to take responsibility for and to self-direct one's learning as self-regulation of learning.

Self-Regulated Learning

Background

The self-regulated learning (SRL) research literature has identified those processes that characterize self-regulated learners. Zimmerman (1989a, 1989b) defined self-regulated learners as "metacognitively, motivationally, and behaviorally active participants in their own learning process" (p. 329). This belief emphasizes that individuals' learning must involve the use of specified strategies to achieve academic goals on the basis of self-efficacy perceptions to qualify as self-regulated (Zimmerman, 1990).

Zimmerman's (1990) conception of self-regulated learning assumes the presence of three elements: (a) students' SRL strategies, which are actions and processes directed at acquiring information or skills; (b) self-efficacy perceptions about capabilities for the organization and implementation of actions to perform a specific task; and (c) commitment to academic goals such as grades, employment opportunities and social esteem. Corno (1989) similarly characterized self-regulated learners as self-starters who know how to make learning easier for themselves and sustain self-motivation.

Based on these perspectives, self-regulated learners can be regarded as those who: (a) actively control the resources available to them, such as time, study environment, helpseeking, and peer learning; (b) control and change their motivational attributes including self-efficacy, goal orientation, and control their emotions and achieve to improve their learning; and (c) know how to utilize cognitive strategies for learning (Pintrich, 1994).

Components of Self-Regulated Learning

Most SRL models assume that self-regulated learners engage in the use of both cognitive and metacognitive strategies for learning as well as endorse adaptive motivational beliefs (Pintrich & De Groot, 1990; Pressley, Borkowski, & Schneider, 1989; Zimmerman, 1989b, 1994). There are a number of motivational beliefs that can be adaptive, but three concepts have gained the most attention: intrinsic orientation, self-efficacy, and task value. Intrinsic orientation involves a focus on learning and mastery rather than on grades or performance, and it has been linked to better strategy use and performance (Ames, 1992; Dweck & Legett, 1988; Wolters, 1998;). Students' judgment of their capability to learn, self-efficacy, is also positively related to strategy use and academic performance (Schenk, 1991; Williams, 1996). Finally, task value beliefs that involve students' perceptions of the importance, utility, and interest of the task have been related to both strategy use (Pintrich & De Groot, 1990; Schiefele, 1991) and actual achievement (Wigfield & Eccles, 1992). These three motivational beliefs might represent the motivational components of SRL (Vanderstoep, Pintrich, & Fagerlin, 1996).

Learners need to be motivated to use the strategies and to regulate their cognition and effort. It has been found that student's perceptions of the learning environment, motivational orientations, and beliefs about learning are crucial for cognitive engagement and academic performance. Specifically, the appearance of motivational components such as value, expectancy, and affect can lead to three general types of motivated behavior: choice, level of activity or engagement, and persistence (Pintrich, Roeser, & De Groot, 1994). Some argue that these components are not sufficient in and of themselves for guaranteeing successful academic performance because self-regulatory skills or SRL strategies are more directly implicated in performance (Pintrich & DeGroot, 1990: Pintrich et al., 1994). However, other experts in the area of self-regulated learning maintain that in order for learners to successfully engage in cognitive SRL strategies, it is crucial that they demonstrate intrinsic goal orientation, self-efficacy for learning and self-regulation, effort regulation, a belief in the importance and utility of what they are learning, and appropriate time and place management skills for studying (Boekarts, Pintrich, & Zeidner, 2000; Demetriou, 2000; Kuhl, 2000; Pintrich, Smith, Garcia, & McKeachie, 1991; Ryan & Deci, 2000). Without the presence of these elements, these experts maintain that it is doubtful whether individuals can successfully engage in cognitive SRL strategies (Boekarts, Pintrich, & Zeidner, 2000; Wolfe, 2000; Wolters et al., 2003). These factors, then, are necessary precursors for self-regulated learning and metacognitive strategies. As such, they are important factors for successful self-regulated learning.

Metacognitive strategies for learning include planning, monitoring, and regulating. These strategies are linked to better academic performance. Metacognition generally has been referred to as knowledge and regulation of one's own cognitive system (Palincsar & Brown, 1987). In other words, metacognition involves individuals' awareness of their own thinking. Many of the self-regulatory skills refer to generalized skills for resolving problems and for monitoring performance. Metacognition, therefore, enables students to coordinate the use of current knowledge and a range of reflective strategies to accomplish their goals. It serves as a mental executive function that is essential for effective learning because it allows students to regulate numerous cognitive skills (Schraw & Dennison, 1994).

Learners who possessed better metacognitive SRL strategies empirically were found to perform better in a learner-controlled instruction, compared to non-self-regulated learners. Research has shown that metacognitive control helps to guide and direct students' cognition (Pintrich et al., 1994; Zimmerman,1990). Lan (1996) specifically found that self-monitoring students were more actively involved in their learning activities and had better academic performance than non-self-monitoring students. The effective use of SRL strategies also was found to influence performance in learner-controlled computer-based instruction (Oliver & Shapiro, 1993). Therefore, metacognitive control is an important component of SRL which affects learning and performance.

Self-Regulated Learning and its Context

Self-regulating students are assumed to be aware of and able to control their actions in order to reach learning goals, and an important aspect of this awareness and control is the ability to overcome contextual difficulties (Corno, 1989; Zimmerman & Martinez-Pons, 1990). This ability to overcome problems includes the power to create one's own goals for a learning situation, to gather motivation for that goal, and to enlist the cognitive resources necessary to reach the goal. Self-regulated learners are expected to be able to avoid or overcome obstacles that obstruct their learning goals. Past research on self-regulation has reflected this view by examining self-regulation within particular contexts (Pintrich & De Groot, 1990). This view suggests that there might not be variations in self-regulation by context. Therefore, several SRL models have assumed that the positive relations between adaptive motivational beliefs, the use of cognitive and metacognitive strategies, and academic performance will be similar across situations and contexts.

Conversely, many other researchers contend that there are variations in the relative importance of different personal attributes depending on the context. Zimmerman (1994) suggested that the nature of the classroom context plays an important role in facilitating SRL. Settings that allow for learner choice or control related to time, tasks, and strategies facilitate the use of self-regulatory strategies. Ames (1992) and Travers (2000) showed that aspects of the classroom environment and the type of learning tasks could be designed in order to positively influence student use of SRL. For example, in a study involving community college students, Travers (2000) demonstrated that specific instructional methods could facilitate student use of self-regulated learning in an algebra course.

Learning in asynchronous online environments requires students to use computer technology in order to learn. For some individuals this can present a contextual obstacle to their learning that they must overcome in order to achieve. For individuals with relatively little prior computer experience, learning in AWB environments presents an obstacle that they need to overcome in order to succeed academically. Individuals with prior experience using computer technology are more likely to overcome this obstacle than other individuals with less computer experience (Lan, 1996; Lim, 2001; Young, 1996;). Moreover, these experienced students are also more likely to describe themselves as self-efficacious in their use of computer technology.

Hill and Hannafin (1997) also studied the influence of participants' self-efficacy beliefs, or their confidence in using computers, on the number and types of strategies they used in a Web search. The results showed that students who had described themselves as effective in using computer technology not only reported that they used more search strategies but also included more sophisticated strategies for searching the Web than other participants who had been categorized as low in their self-efficacy for computer use. Self-efficacy beliefs concerning computer use may then be an important variable that influences learning achievement in a computer-based environment.

On the other hand, Lim (2001) showed that computer self-efficacy is only highly correlated with satisfaction and the intent to participate in more Web-based courses. Campbell (1996) also investigated factors such as motivation, task value, and self-efficacy as related to successful persistence in telecourses and found that all persisters had higher mean scores than non-persisters for the following scales: intrinsic goal orientation, task value, and self-efficacy for learning and performance. Computer self-efficacy will be discussed again later in this chapter as a potential predictor of academic achievement in asynchronous Web-based courses.

Self-Regulated Learning and Computer-Mediated Learning

While this area of investigation is rich with descriptive studies that demonstrate the relationship between learner achievement and instructional media design such as the use of hypertext and multimedia (Clarke, 1994; Hannafin, Land, & Oliver, 1997), there are few studies that specifically looked at the relationship between learner use of SRL and learner achievement in a computer-mediated environment. Computer-mediated instruction such as AWBL courses are examples of non-linear learning environments. As such, they are more learner-centered or learner-controlled environments than traditional classroom-based environments (Anderson, 1997, 2000; Wolfe, 2000). Achievement in such environments requires that one be able to self-manage learning and studying.

Young (1996) demonstrated in a study with seventh-grade students that those students who were high self-regulators of their learning were more successful in non-linear computer mediated learning environments than were students categorized as low self-regulators. Poor performance by subjects with low self-regulatory learning strategies (SRLS) under learner control indicated a strong need for learners to possess self-regulatory learning strategies to achieve success under learner control. Program control, however, seemed to minimize the performance differences between low and high levels of SRLS (Young, 1996).

McManus (2000) obtained similar results with undergraduate education majors enrolled in a computing tools for educators course at a southwestern university. This quantitative study suggested that learner level of self-regulated learning and the degree of linearity of the learning environment affect learner achievement. Students were categorized as high, medium, or low self-regulators according to the results of a self-report inventory called the *Motivations and Strategies for Learning Questionnaire* (MSLQ). This is a popular self-report inventory widely used in self-regulated learning research and will be described in more detail in the next chapter. Although the results were only nearly statistically significant, they did suggest that high self-regulators learned poorly in mostly linear Web-based hypermedia learning environments where they had very few choices, while medium self-regulating learners learned poorly in highly nonlinear environments where they were given too many choices (McManus, 2000).

These studies demonstrated that individuals who are high self-regulators tend to achieve at higher rates in non-linear learning environments where learners must exert control over their learning. Furthermore, these studies suggest that the self-regulated learning level may be an important learner characteristic that can predict success in asynchronous online learning.

Self-Regulated Learning and Academic Achievement in Online Settings

Most studies investigating the possible correlation of SRL with learning achievement in online settings have relied heavily on limited design methods such as bivariate correlation to establish relationships of SRL factors with learning achievement.

In his study of undergraduates in an information technology course at a public university in the southeast, McManus (2000) had students first complete the MSLQ inventory in order to assess their SRL level. Then both groups were taught a lesson involving computer technology. At the completion of the lesson, he evaluated both groups on computer knowledge and skill level. Results showed that the high self-regulating students tended to earn higher final grades than the low self-regulators. While the results approached statistical significance, they were not significant at the .05 level. This may be explained by the failure to control for the effects of other variables on learner achievement. For example, it was previously argued that self-efficacy for computer use may be a factor that influences learning achievement in online environments. In McManus's study, all the study participants were students who were required to take the computing tools for educators course because they could not demonstrate a minimum level of competency on the pre-course assessment. Therefore, it is possible that their low computer competency and self-efficacy may have affected the study results.

In a study of online learners, Hargis (2000) looked at 145 undergraduate engineering students from a major southern university in order to determine whether individual level of self-regulated learning ability correlated with improvement on a pre- and post-assessment based on an online instructional module. Although results from ANCOVA confirmed the researcher's hypothesis that those individuals with high self-regulation would learn successfully via the Internet, there was a basic flaw in this study design. The study sample consisted exclusively of engineering students with technical computer expertise. As a result, all of the participants scored high on the SRL measure and shared high competency as well as high self-efficacy levels for computer use. Hargis cautioned, therefore, that while it was true for this group that the better the student was at self-regulating their own learning, the higher their success for learning on the Internet, this conclusion cannot be generalized to all students without first conducting further research with a more varied sample of participants. Hargis further recommended that future studies be done that include samples from a variety of academic disciplines and include individuals with different levels of self-efficacy for computer technology use.

The McManus (2000) and Hargris (2000) studies demonstrated the weakness of the bivariate correlational design that characterizes many studies in self-regulated learning. In the upcoming section of this literature review "Designing a predictive model of learning in asynchronous hypermedia," examples of studies that use predictive modeling will be presented.

Why Some Students Fail to Self-Regulate

While most researchers consider SRL as an individual trait, some tend to regard self-regulated learning more as a skill that can be taught. Hofer, Yu, and Pintrich (1998) maintained that SRL is a teachable skill; yet despite having SRL behavior modeled by instructors, there are individuals who fail to transfer these skills into a new learning setting.

Some argue that this failure to utilize SRL may be due to other learner characteristics that can affect an individual's propensity for self-regulated learning. Research suggests that one learner characteristic that may affect self-regulated learning is the learner's epistemological beliefs (Bendixen & Hartley, 2003; Hofer, 2002; Schraw & Dennison, 1994). These personal beliefs about knowing and learning that individuals hold may influence how they approach their learning.

Epistemological Beliefs

Background

Epistemological beliefs are beliefs about the nature of knowledge and the process of learning. Researchers have shown that epistemological beliefs have an important influence on students' thinking and learning (Dweck & Leggett, 1988; Hammer, 1994; Hofer & Pintrich, 1997; Schommer & Walker, 1997). Earlier conceptions of epistemological beliefs have been dominated by the work of Perry (1970). Based on questionnaires and in-depth interviews conducted with undergraduate students at Harvard University, Perry proposed that many first-year college students come to college thinking that knowledge is simple, certain, and handed down by authority. By the time these students reach their senior year, the majority tend to believe that knowledge is complex, tentative, and derived through reasoning and empirical evidence. Perry documented the progress of students through four main stages, which he described as dualism, multiplism, relativism, and commitment.

Building on work pioneered by Perry (1970), researchers have investigated the relationship between epistemological beliefs and ill-structured situations. For example, Kitchener and King (1981) introduced the Reflective Judgment Model to characterize the development of an individual's justification of knowledge. These researchers suggested that learners move from the early stage of a belief in absolute, concrete knowledge that is justified by approval of authority to a final stage of belief in tentative, context-dependent knowledge that is justified by expertise and the reasoning process. Belenky, Clinchy, Goldberger, and Tarule (1986) and Baxter-Magolda (1993) proposed stages of epistemological development similar to those described by Perry (1970). According to Belenky et al. (1986), there are five stages in the development of one's beliefs about knowledge. These stages are (a) silence, (b) received (similar to Perry's dualism), (c) subjective (similar to Perry's multiplism), (d) procedural (similar to Perry's relativism) and (e) constructed (similar to Perry's commitment) ways of knowing. Using a sample of both male and female college students, Baxter-Magolda (1993) suggested four stages of knowing: (a) absolute (similar to Perry's dualism), (b) transitional (similar to Perry's multiplism), (c) independent (similar to Perry's relativism), and (d) contextual transitional (similar to Perry's commitment position). Although many of Perry's followers (Baxter-Magolda, 1994; Kitchener & King, 1981; Ryan, 1984) have found links between students' cognition and the unidimensional measure of Perry's epistemic schema, others failed to find this conceptualization useful (Glenberg & Epstein, 1987). It is possible that the uni-dimensional approach cannot adequately capture the nature of personal epistemology. The extent to which beliefs about knowing can be considered to be a unidimensional set of beliefs has also been questioned.

With a synthesis of previous research and the desire to capture the complexity of personal epistemology, Schommer (1990) began to investigate epistemological beliefs in the late 1980s. As an alternative model to Perry's (1970) unidimensional construct, Schommer suggested that personal epistemology would be better portrayed as a system of more-or-less independent beliefs. She viewed epistemological beliefs as being multidimensional. By "system of beliefs," it is meant that there is more than one belief to consider in defining a personal epistemology. By "more-or-less independent," it is meant that individual beliefs within the system may develop at different rates or may be inconsistent with each other. For example, an individual may believe that knowledge is highly complex, yet that person may also believe that knowledge is certain and never changing. Schommer's work focused on identifying epistemological beliefs as independent cognitive dimensions, including beliefs about the certainty and simplicity of knowledge, speed of learning, and the role of effort and ability in intelligence. From Schommer's viewpoint, a learner may approach a classroom situation differently (and more-or-less successfully) depending on whether he or she believes that ability to learn is fixed and innate or that ability to learn is changeable and is acquired through persistent effort. For example, a student who holds naive epistemologies along all five dimensions generally believes: (a) that knowledge is handed over by the authorities and is thus fixed, (b) that concepts are learned quickly or not at all, (c) that learning ability is innate, and (d) that knowledge is simple, clear, and specific. On the contrary, an individual who holds sophisticated epistemologies generally believes that knowledge is complex and uncertain; yet, this person believes that knowledge can be learned gradually through reasoning processes and can be structured by the learner.

Epistemological Questionnaire (EQ)

In order to assess a system of epistemological beliefs, a questionnaire (Schommer, 1990) was developed to assess beliefs along four epistemological dimensions: (a) ability to learn, ranging from the idea that ability to learn is fixed at birth (naive) to the idea that ability to learn can be changed (sophisticated); (b) structure of knowledge, ranging from the belief that knowledge is best characterized as isolated bits of knowledge (naive) and pieces to knowledge is best characterized as highly interrelated networks (sophisticated); (c) speed of learning, which includes beliefs ranging from the belief that learning is quick or all-or-none (naive) to the belief that learning is gradual (sophisticated); and (d) stability of knowledge, ranging from the belief that knowledge is unchanging (naive) to the belief of knowledge is evolving (sophisticated). The content of the epistemological questionnaire (EQ) was screened by professionals in the field of educational psychology and most of the items were originally derived from observations and interview questions from Kitchener and King (1981) and Schoenfeld, Dweck, and Perry (as cited in Schommer-Aikens, 2002). There is a .74 test-retest reliability and .63 to .85 inter-item correlation for items within each belief factor. In addition, each belief in EQ can predict certain student performance. For example, belief in ability to learn predicts students' value of education, and belief in structure of knowledge predicts comprehension in academic text and thinking on everyday controversial issues. In addition, belief in speed of learning predicts comprehension monitoring, and belief in stability of knowledge predicts students' conclusions of tentative text (Duell & Schommer-Aikens, 2001).

This four-dimensional factor structure, which was first used with postsecondary students (Schommer, 1990), has been replicated by other researchers (Jehng, Johnson, & Anderson, 1993) and applied with different sample subjects, such as other college students (Schommer, 1998; Schommer, Crouse, & Rhodes, 1992) and high school students using a modified version of EQ (Schommer, 1993b; Schommer, Mau, & Brookhart, 2000; Schommer & Walker, 1997). Following Schommer's theory of epistemological belief system, researchers have started to examine the concept of the multidimensional system of epistemological beliefs (Hall, Chiarello & Edmonson, 1996; Kardash & Scholes, 1996) as it relates to the cognitive and affective domains. Some researchers have developed new instruments to assess epistemological beliefs (King & Kitchener, 2002; Schraw, Bendixen, & Dunkle, 2002; Wood & Kardash, 2002). Others have tried to modify Schommer's theory by either adding or subtracting beliefs and elaborating on their own theory (Hofer & Pintrich, 1997).

Epistemological Beliefs Inventory (EBI)

In an attempt to improve on Schommer's (1990) epistemological questionnaire (EQ), Schraw, Bendixen and Dunkle (2002) created the epistemological beliefs inventory (EBI). It is a shorter and more efficient instrument to administer than the EQ; nevertheless, using factor analysis procedures similar to those used in validating Schommer's EQ, the EBI yielded better construct validity than the EQ (Schraw, Bendixen & Dunkle, 2002). Finally, in a study designed to compare the two instruments, researchers found that the EBI had better predictive ability and explained more of the variance in their study sample than the EQ did (Bendixen & Hartley, 2003). As a result, the EBI instrument was used in the current study.

Epistemological Beliefs, Learning, and Technology-Supported Learning

Given the conflicts of epistemological belief theories and models, it is fundamental to understand the relationships between learning and such beliefs. Research in the early 1990s revealed that students who strongly believe that learning is quick or all-or-none tend to produce superficial summaries of their readings and fail to comprehend or monitor their comprehension of text adequately (Schommer, 1990). Empirical studies indicated that a belief in speed of learning predicted problem-solving skills in ill-structured content (Schraw, Dunkle, & Bendixen, 1995) and had a negative relationship with a student's grade point average (Schommer, 1993b; Schommer & Dunnell, 1994). Students who strongly believe that knowledge is simple usually have difficulty understanding basic statistics (Schommer et al., 1992). Schraw et al. (1995) concluded that beliefs in simple knowledge relate to students' problem solving of ill-structured content, while Schommer et al. (1992) suggested that beliefs in simple and certain knowledge relate to students' study strategies and comprehension of text. It seems that the more students believe that knowledge is simple, certain, and handed down by authority, the more likely they are to oversimplify complex text information, perform poorly on academic assessments, misinterpret tentative conclusions, and seek single answers when multiple answers are more appropriate (Duell & Schommer-Aikens, 2001).

Research on epistemological beliefs indicates that individuals' epistemological beliefs affect their learning and performance. Yet only a few studies explore the relationship between epistemological beliefs and performance in hypermedia-supported authentic learning environments. For example, Jacobson and Spiro (1995) documented the preliminary findings that the epistemological beliefs system will influence learning in a hypertext-based learning environment. The characteristics of hypertextual learning environments (nonlinearity, interrelated knowledge, the focus on independent thinking and knowledge transfer) may diverge from the pre-existing epistemological beliefs held by students. Students with a complex set of epistemological beliefs about the nature of learning perform at a higher level on tests of knowledge transfer when learning in hypertext programs than those students with a simpler set of epistemological beliefs. Such results are generally consistent with other research that documents the influence of epistemological beliefs on learning (Jacobson & Spiro, 1995).

On the other hand, a more recent research study yielded mixed results regarding the influence of complex versus simple epistemological beliefs and achievement in hypermedia.

In their study involving 116 undergraduate teacher education students enrolled in an educational psychology course, Bendixen and Hartley (2003) confirmed previous research findings that belief in omniscient authority and fixed ability are related to lower achievement. However, contrary to expectations, a belief in quick learning was positively correlated with high achievement on a post-test based on hypermedia tutorial content. The researchers explained this finding as probably due to the nature of the academic task itself. Schommer (1990) found that belief in quick learning was related to poor performance in a complex problem solving task. In Bendixen and Hartley's study (2003), students had only 30 minutes to complete the well-defined task presented to them. As a result, a belief that learning happens quickly or not at all may have actually aided some students to navigate through the hypermedia tutorial in a timelier manner. Furthermore, the objective assessment at the end of the tutorial may not have required higher levels of thinking; thus, the belief in quick (potentially low-level) learning may not have been a detriment to their performance (Bendixen & Hartley, 2003). These mixed findings demonstrate, then, that more research needs to be done in order to validate the methods of assessing personal beliefs as well as better understand how these beliefs may influence learning in technology-based learning environments.

Support for Combining SRL and EB in Learning Research

Flavell (1999) and Hofer (2001) proposed that individual level of self-regulated learning and level of epistemological beliefs complement each other such that those who are high self-regulators also harbor sophisticated beliefs about knowledge and learning. They maintained that both constructs may overlap in the area of metacognitive thinking such that both high self-regulated learning and sophisticated EBs are characterized by metacognitive control of thinking and learning (Flavell, 1979). While this is an intriguing proposition, there is relatively little empirical research that shows a relationship between epistemological beliefs and SRL. However, Paulsen and Feldman (1999) looked at 246 undergraduate education students at a large urban public university in order to test Flavell and Hofers' original notion. Students completed both the *Measure of Self-Regulated Learning* questionnaire (MSLQ) and the *Epistemological Beliefs* (EB) questionnaire. Then the responses for the SRL measure were regressed on all dimensions of the EB questionnaire. The result was that each SRL factor was related to at least one and up to three EB dimensions. Based on these results, the authors concluded that those students with sophisticated EB were more likely than others to be engaged in SRL strategies. Paulsen and Feldman's study, therefore, suggests a positive relationship between SRL and epistemological beliefs.

Both research genres contain many examples of studies that have yielded limited relationships of each construct (SRL/EB) with learning achievement. However, if both constructs are positively related, then perhaps combining them in the same study can yield a stronger explanatory model of learner achievement in AWBL.

Other Predictors of Achievement in AWBL Environments

In addition to SRL and EB factors, there are other important variables that have been previously shown to influence learner achievement. These factors include: self-efficacy for using computer technology, reason for taking an online course, and prior college academic achievement (as determined by GPA).

Self-Efficacy for Using Computer Technology

This study examined asynchronous Web-based learning. Successful learning in this environment requires the ability to use computer technology. Therefore, it is important to include a covariate related to computer use in the proposed research model of learning achievement in online learning.

Many studies designed to identify factors related to learning achievement in online environments have shown that self-efficacy for computer use correlates with level of learning achievement as measured by course final grade (Agarwal et al, 2000; Joo, Bong, & Choi, 2000; Lee, 2002; Wang & Newlin 2002a, 2002b). For example, Wang and Newlin's (2000) quantitative study of college undergraduates enrolled in an online research methods in psychology course found that students' self-efficacy beliefs concerning their use of computer technology correlated with final course grade in the course.

Reason for Taking Online Courses

As noted previously, social learning theorists posit that one of the elements of self-regulation that leads to effective learning is the student's choice of learning strategies that are likely to contribute to reaching specific goals. However, a search of the distance learning literature reveals that there are few studies that are concerned with why students choose online learning over traditional classroom-based methods. As Robyler (1999) pointed out, most studies focus on demographic characteristics of students (mainly working adults of non-traditional college age) who take online courses. Other studies have focused on characteristics of students who seem to learn successfully when they choose an online format. For example, Willis (1993) noted that learners have a wide variety of reasons for pursuing asynchronous online learning, including: (a) constraints of time, distance, and finances; (b) the opportunity to take courses or hear outside speakers who would otherwise be unavailable; and (c) the ability to come in contact with other students from different social, cultural, economic, and experiential backgrounds. Willis concluded that individuals not only gain new knowledge but also new social skills, including the ability to communicate and collaborate with widely dispersed colleagues and peers whom they may have never seen.

Many current online courses incorporate cooperative learning, live projects, and interactivity within groups of students as well as between virtual sites and physical sites (Anderson, 1997; Aviv, Ehrlich, & Giva, 2003; Byers, 2000; Holloway & Ohler, 1991; Shea, Fredericksen, & Pickett, et al., 2000; Strijbos, Martens & Jochems, 2004). Examples of physical site interaction include: (a) hybrid courses (combination of online and face-to-face activities) in which students meet once a month to interact as a cohort and (b) students pursuing degrees in education or medicine who interact in practicum settings (e.g., hospitals and classrooms). Roblyer (1999) suggested that individual preference for a particular learning method may drive one's choice for either learning online or in the classroom. In his study with community college and virtual high school classes, Roblyer focused on attitude factors and personal characteristics that seemed to motivate students to select distance learning courses as opposed to traditional face-to-face courses. The underlying premise of the study was that students perceive that it is important to have a choice between online and face-to-face formats and that their learning needs and expectations may determine their choice of an instructional delivery system.

In Roblyer's (1999) study, participants were surveyed on four factors likely to influence choice of distance or face-to-face format: (a) need for interaction, (b) logistical factors (e.g., distance from site of traditional course), (c) control over timing and pace of course assignments, and (d) technology background and comfort level. Students were asked to rate each question on a Likert scale of 1 to 5, with 1 representing most important and 5 representing least important. The results indicated that students who choose online formats differ in their perceived learning needs from students who choose face-to-face formats. Furthermore, students who choose online formats do so because they have a higher need and desire for control over their learning environments, while students who choose traditional face-to-face formats have a higher need and desire for interaction with instructors and other class members.

Subsequent research has confirmed Roblyer’s (1999) findings concerning learning achievement in computer mediated online learning. In a quantitative study involving college students enrolled in a research methods in psychology course, Wang and Newlin (2000, 2002b) found that students who enrolled in the Web-based course because they enjoyed Web-based learning environments or were curious about Web-based courses had higher self-efficacy beliefs about their learning and performance and obtained higher final grades than students who enrolled solely because of course availability.

Finally, Collins and Pascarella (2003) conducted a randomized, true-experiment paired with a quasi-experiment with 46 community college students. Those who were randomly assigned to receive instruction at a distance via a two-way interactive telecourse demonstrated learning equivalent to that of students assigned to on-campus, face-to-face instruction. However, students choosing to take the course via telecourse and remote sites had significantly higher course learning than either randomly assigned group (Collins & Pascarella, 2003). These results show that individual choice for the medium of learning has a significant effect on learner achievement. Therefore, it is important to include individual choice as a variable in a study of learner achievement in asynchronous Web-based learning.

Prior College Academic Achievement

Previous studies regarding the determinants of academic achievement in college have generally included measures of previous and current academic achievement such as grade point average (GPA) (Bendixen & Hartley, 2003; DeAngelis, 2003; Garavilia & Gredler, 2002; Ishitani, 2003; Naumann et al, 2003). It is particularly important to include academic achievement (as measured by GPA) in a study that seeks to understand the role played by self-regulated learning on achievement because there is evidence to suggest that individuals with prior academic success are more likely to self-regulate their learning than others. This is because prior academic success influences self-efficacy, an important component of self-regulation (Bandura, 1986; Boekarts, Pintrich, & Zeidner, 2000).

Social cognitive learning theory has proposed that there is a recursive relationship between self-efficacy and cognitive ability as measured by academic achievement. For example, the more that one perceives herself to be self efficacious, the greater the likelihood that she will achieve and increase cognitive ability in a particular academic domain. Moreover, higher levels of individual academic achievement demonstrate greater ability that in turn reinforces the feelings of self-efficacy for that particular academic domain (Bandura, 1997).

Self regulation of learning is comprised of two subfactors that measure individual self-efficacy. Thus, in order to understand the extent to which SRL influences learning achievement, it is important to include the covariate of prior academic achievement in a predictive model of learning achievement. As a result, a regression model can be developed that describes the effect of SRL on achievement when prior academic achievement (GPA) is held constant.

In addition to SRL and EB factors, this study included the variables of self-efficacy for using computer technology, reason for taking an online course, and prior academic achievement (GPA). By carefully scrutinizing all variables, this researcher anticipates being able to design a predictive model of learning for the asynchronous Web-based learning environment.

Designing a Predictive Model of Learning in AWBL Environments

Research concerning the relationship between self-regulated learning, epistemological beliefs and learning achievement appears to have gone through different phases. The first phase is characterized by theoretical and empirical work designed to demonstrate that these two learner characteristics (SRL and EB) exert an influence on learning achievement. Most of this work had been conducted in traditional classroom-based settings (Hofer, Yu, & Pintrich, 1998; Paulsen & Feldman, 1999; Schommer, 1990, 1998, 2000; Wolters, 1998; Zimmermann, 1994).

As institutions of higher learning expand their delivery of learning and course work to asynchronous online learning environments, there are those who call for research that helps to describe how SRL and EB learner characteristics may affect learning in online environments (Diaz, 2002; Hartley & Bendixen, 2001; Merisotis & Phipps, 1999). Because the phenomenon of learner achievement is complex and comprised of multiple factors, it is reasonable to use multiple regression models in order to describe this phenomenon. Unfortunately, the research literature for SRL, epistemological beliefs, and asynchronous online learning contains only a few examples of such studies.

Predictors of Self-Regulated Learning

Garavilia and Gredler (2002) conducted a quantitative study involving students enrolled in a traditional classroom-based undergraduate psychology course. Students' final course grades were regressed on the linear combination of reported use of four self-regulated learning strategies, reliance on external sources for learning guidance, cumulative grade point average (GPA), and aptitude. Analyses indicated that each of the predictor variables was significantly related to course achievement and that the set of variables accounted for 45% of the variance in course achievement. Because variables that are related to achievement typically are also correlated with each other, the regression model allowed the researchers to determine which variable(s) significantly contributed to the explanation of achievement beyond that accounted for by the other variables. Garavilia and Gredler’s study is significant for two reasons. First, it included prior academic achievement and learner aptitude as explanatory variables. Second, the final explanatory regression model demonstrated that subfactors of self-regulated learning explained more of the variation in final course grade than did either prior academic achievement (as determined by GPA) or learning aptitude (as determined by SAT scores).

Chen (2002) looked at the relationship between individual self-regulated learning and final course grade in a study of undergraduates enrolled in an information systems course. This was a combined classroom lecture and lab section course. Chen also used a linear regression model. The findings revealed that effort-regulation had a positive effect on lecture-based learning. However, unlike Garavilia and Gredler’s (2002) study, Chen’s study did not consider prior academic achievement as a variable in the experimental model. She did include a measure of prior computer experience; however, this variable was not a significant factor in the final explanatory model.

Predictors of Epistemological Beliefs

Only two examples were found of studies that used linear regression models in their design in order to investigate the influence of epistemological belief factors on learning achievement. Both studies looked at undergraduate students in public four-year universities.

Bendixen and Hartley's (2003) study examined the relationship between epistemological beliefs, metacognition, and student achievement in a hypermedia learning environment. The researchers predicted that the epistemological beliefs and metacognitive awareness of 116 pre-service teachers enrolled in an educational psychology course would be significantly related to achievement in a hypermedia tutorial. Achievement was measured by a post-test based on the tutorial content. Regression analysis indicated that reading comprehension, GPA, and three of the five epistemological beliefs (viz., innate ability, omniscient authority, and quick learning) significantly predicted post-test performance. While their model included prior academic achievement (GPA) and reading comprehension, it did not include prior computer experience. Interestingly, unlike previous studies, Bendixen and Hartley found that individual metacognitive awareness was not a factor associated with learning.

In a study of 60 teacher education students enrolled in a special education methods course, Peng (2003) demonstrated a relationship between three epistemological beliefs (viz., innate ability, structural knowledge, and quick learning) and individual learner achievement in a case-based hypermedia teaching environment. Although, her research design included prior academic achievement as an explanatory variable, it did not consider the influence of prior computer experience or computer self-efficacy on final course grade. While it is true that the focus of this research was the influence of epistemological beliefs on learner outcomes, it would have been useful to include prior computer experience as a variable because learning occurred via the computer.

This literature review demonstrates that more research is needed in order to determine how self-regulated learning and epistemological belief factors affect learning in asynchronous online environments. Furthermore, learning is a complex phenomenon that is influenced by a variety of factors. Consequently, further research should be done in order to develop a model that explains how SRL and epistemological beliefs affect learner achievement in the presence of other covariates known to influence learning achievement in online environments.

Summary

This chapter reviewed the literature in asynchronous online learning, self-regulated learning, and epistemological beliefs. The purpose was to demonstrate the need to expand research on the role of learner characteristics and achievement in asynchronous online learning environments. In particular, this expansion includes the combined roles of self-regulated learning and epistemological beliefs in affecting learning achievement in online learning.

The literature revealed that SRL and EB have traditionally been treated as separate genres and research efforts have been limited to examining the variables' separate connections with learning achievement. The result has been moderate relationships between each construct and learning achievement. However, it is proposed that by combining both factors in the same study of learning achievement, investigations might yield a more compelling explanation of learning achievement in AWBL.

Finally, an argument was made for considering prior academic achievement, self-efficacy for using computer technology, and reason for taking an online course in a study of SRL, EB, and learning achievement in order to control for these variables' known influence on learning achievement in the online instructional environment. Chapter three lays out the methodology this researcher used to determine the predictive order of individual levels of self-regulated learning (SRL) and epistemological beliefs (EB) on learner achievement in asynchronous Web-based courses.

CHAPTER III: METHODS

The purpose of this study was to determine the predictive order of individual levels of self-regulated learning (SRL) and epistemological beliefs (EB) on learner achievement (final course grade) in asynchronous Web-based courses. This chapter presents the design parameters for the study. It begins with a description of the research approach, study participants, and a description of the study variables, including covariates. The chapter also includes a discussion of the sources of data and how they were collected. It concludes with a discussion of how the data was analyzed.

Design

A cross-sectional predictive study was used in order to examine the effect of the following factors on learning achievement in asynchronous online undergraduate courses: (a) subfactors of self-regulated learning, subfactors of epistemological beliefs, self-efficacy for computer technology, reason for taking a Web-based course, and prior college academic achievement on learning achievement.

Pilot Study

Approximately one month prior to conducting the actual investigation, the survey instrument developed for use in the study was tested with undergraduate students enrolled in health services and information management courses. The pilot study resulted in minor changes to the wording and sequencing of question items. Otherwise, no major changes were made to the instrument based on the pilot study results.

Sample

The site of the present study was a coeducational public university situated in the southeastern region of the United States. According to registrar records, approximately 2,700 students were enrolled in Web-based undergraduate courses at the university during the spring 2005 semester. A total of 629 students, or about a quarter of this group was selected via a random numbers procedure to receive a recruitment e-mail (see Appendix A). Finally, 201 individuals from this group completed the study questionnaire. The final response sample used in the study was considered adequate because it reflected the required threshold of at least 200 observations, a minimum requirement for multiple regression (Hatcher & Stepanski, 1994). Furthermore, Neter, Wasserman & Kutner (1990) recommend six to ten cases for every variable in the pool. As there were 14 predictor variables in the present study and a total of 200 individual participants, this study met the prescribed minimum sample size.

The study sample did not differ from the larger population of online learners according to demographic characteristics such as age and gender. Data collection occurred during the spring 2005 academic semester.

Instrumentation

Data was collected via a single self-report inventory. Survey questions were taken from the following two instruments as a means of collecting data relative to the variables of self-regulated learning (SRL) and epistemological beliefs (EB). The questions were adapted where necessary to apply to the Web-based learning environment. The survey was created in SelectsurveyASP™ and was accessible on the university Web server as a Web-based form to study participants only.

Motivated Strategies for Learning Questionnaire (MSLQ)

The Motivated Strategies for Learning Questionnaire (MSLQ) is designed to assess college students' motivational orientations and their use of self-regulated learning. It was normed using a sample of 380 students, mostly from public, four-year, midwestern institutions. Permission for using this scale was obtained from Pintrich, Smith, Garcia, & McKeachie (1991) and the University of Michigan.

The questionnaire measures a total of 15 subfactors associated with self-regulated learning of which six were used in this study. The subfactors that were measured are: (a) intrinsic goal orientation, (b) expectancy or control of learning, (c) self-efficacy for learning and performance, (d) metacognitive self-regulation, (e) time and study resource management, and (f) effort regulation. Because the literature has emphasized the key role played by these six subfactors in establishing the foundation for successful self-regulated learning, only their potential effect on learning achievement was considered in this study. There were four Likert-scaled questions per factor for a total of 24 questions. Responses to each question were coded from 1 (not at all true of me) to 7 (very true of me). Those items requiring reverse coding were coded 8-x, (x denotes the original coded response for that item). Each variable was operationalized by summing the scores for the questions in each factor. Although, some question items were modified in order to reflect the Web-based learning environment, the original meaning of the question item remained intact.

Although both the original as well as subsequent researchers have claimed validity and reliability for the MSLQ, a search of the literature could not find evidence of factor analysis ever having been conducted with the original instrument (Barker & Olson, 1999; Chen, 2002; Hargis, 2000; McManus, 2000; Pintrich & Smith, 1993; Ross, 1999). Therefore, it was decided to subject the self-regulated learning question items to exploratory factor analysis. Moreover, the decision to perform a factor analysis of the SRL question items was also taken for two additional reasons: (a) the current study sample differed demographically from the original norming sample and (b) the current study sample completed the survey questions with computers via the Internet as opposed to paper and pencil in a classroom environment.

Validity. Because the confirmatory factor analysis results for self-regulated learning question items were ambiguous (Pintrich, Smith, Garcia, & McKeachie, 1993) and could not be compared with a prior exploratory factor analysis, it was decided to conduct an exploratory factor analysis of the SRL question items in this study. Table 1 provides a listing of the SRL factors and how they were assessed.

Reliability. The internal reliability coefficients for the six SRL factors in this study are as follows: (a) intrinsic goal orientation, .74; (b) control of learning, .68; (c) self-efficacy for learning and performance, .93; (d) metacognitive self-reguation, .79; (e) time and management resource management, .76; and (f) effort regulation, .69. These reliabilities are based on a sample of 380 college students who attended a four-year public univesity in the midwest (Pintrich & Smith, 1993). Although some of these are low to moderate reliability coefficients, nevertheless, they have been stable across use in a variety of research settings and protocols (Barker & Olson, 1999; Chen, 2002; Hargis, 2000; McManus, 2000; Ross, 1999).

Epistemological Beliefs Inventory (EBI)

The Epistemological Beliefs Inventory (EBI) is a self-report inventory used to measure learners' beliefs about epistemological beliefs or the nature and acquisition of knowledge. It was normed using a sample of 160 undergraduates at a large midwestern university. Permission for using this scale was obtained from Bendixen (2003).

Table 1
Independent Variables for Self-Regulated Learning (SRL)

SRL Variable	Definition of Factor[1]	Measure	How Quantified
Intrinsic goal orientation	Degree to which student participates in the course for reasons such as challenge, curiosity, and mastery. Taking course is an end in itself rather than a means to an end.	4 Likert-scaled questions from the MSLQ. Scale 1-7; 1: "not at all true of me" to 7: "very true of me"	∑ scores
Expectancy: Control of learning beliefs	Student's beliefs that their efforts to learn result in positive outcomes. Includes belief that outcomes contingent on one's own efforts, rather than on the teacher.	4 Likert-scaled questions from the MSLQ. Scale 1-7; 1: "not at all true of me" to 7: "very true of me"	∑ scores
Self-efficacy for learning and performance	Judgments about one's ability to accomplish a task as well as confidence in one's skills to perform well. Includes expectancy for success.	4 Likert-scaled questions from the MSLQ. Scale 1-7; 1: "not at all true of me" to 7: "very true of me"	∑ scores
Metacognitive: Self-regulation	Awareness, knowledge and control of cognition. Three general processes comprise metacognition: planning; monitoring; and regulating.	4 Likert-scaled questions from the MSLQ. Scale 1-7; 1: "not at all true of me" to 7: "very true of me"	∑ scores
Time and Study resource management	Student ability to manage and regulate time and study environments	4 Likert-scaled questions from the MSLQ. Scale 1-7; 1: "not at all true of me" to 7: "very true of me"	∑ scores
Effort regulation	Ability to control effort and attention in the face of distractions and uninteresting tasks.	4 Likert-scaled questions from the MSLQ. Scale 1-7. 1: "not at all true of me" 7: "very true of me"	∑ scores

[1] Adapted for use by permission from Pintrich, Smith, Garcia, & McKeachie, (1991). *A Manual for the Use of the Motivated Strategies for Learning Questionnaire* (MSLQ).

The questionnaire measures five dimensions of epistemological beliefs. They are: (a) omniscient authority (five questions), (b) certain knowledge (eight questions), (c) quick learning (five questions), (d) simple knowledge (seven questions), and(e) innate ability (seven questions). There were a total of 32 Likert-scaled question items related to epistemological beliefs included on this study's survey. Responses to each question were coded from 1 (strongly disagree) to 5 (strongly agree). Those items requiring reverse coding were coded 6-x, (x denoting the original coded response to the item). Each variable or sub-factor was operationalized by summing the scores for the questions under that factor. Table 2 provides a listing of the epistemological beliefs factors and how they were assessed.

Table 2
Independent Variables for Epistemological Beliefs (EB)

EB variable	Definition of factor[1]	Measure	How quantified
Omniscient authority	Authorities have access to otherwise inaccessible knowledge.	5 Likert-scaled questions from the EBI. Scale :1-5. 1 : "Strongly disagree" to 5: "Strongly agree."	∑ scores
Certain knowledge	Absolute knowledge exists and will eventually be known.	8 Likert-scaled questions from the EBI. Scale :1-5. 1 : "Strongly disagree" to 5: "Strongly agree."	∑ scores
Quick learning	Learning occurs in a quick or not at all fashion	5 Likert-scaled questions from the EBI. Scale :1-5. 1 : "Strongly disagree" to 5: "Strongly agree."	∑ scores
Simple knowledge	Knowledge consists of discrete facts.	7 Likert-scaled questions from the EBI. Scale :1-5. 1 : "Strongly disagree" to 5: "Strongly agree."	∑ scores
Innate ability	The ability to acquire knowledge is endowed at birth.	7 Likert scaled questions from the EBI. Scale :1-5. 1 : "Strongly disagree" to 5: "Strongly agree".	∑ scores

[1] Adapted for use by permission from Schraw, Bendixen, & Dunkle (2002). Development and Validation of the Epistemic Belief Inventory (EBI).

Validity. Confirmatory factor analysis yielded the five factors that are the focus of this study and that were originally proposed by Schommer's extensive research on epistemological beliefs (Schommer, Crouse, & Rhodes, 1992; Schraw, Bendixen, & Dunkle, 2002). Each factor included at least three items with loadings in excess of .40 and none of the items with loadings in excess of .40 on one factor, loaded on another factor. The factor groupings each represented a unique construct (Schraw, Bendixen, & Dunkle, 2002).

Reliability. The internal reliability coefficients (Cronbach alpha) for the five factors are as follows: (a) omniscient authority, .68; (b) certain knowledge, .62; (c) quick learning, .58; (d) simple knowledge, .62; and (e) innate ability, .62. These reliability scores are based on a sample of 160 undergraduates enrolled in an introductory educational psychology class at a large midwestern university (Schraw, Bendixen, & Dunkle, 2002). Although these internal reliability coefficients are on the moderate to low side, they did prove to be stable in the use of this instrument in a research study conducted with undergraduate teacher education students at a midwestern university (Bendixen & Hartley, 2003). Despite this validation, the researchers called for further research that might add information about the validity and reliability of the instrument when used with a larger sample of undergraduate students from a variety of academic courses.

Therefore, given the lack of follow up validation studies that used the EBI and the original developers own call for further validation research, it was decided to perform an exploratory factor analysis of the epistemological beliefs question responses with the current study sample. Measures of the internal reliability for both instruments (MSLQ and EBI) on the sample were then conducted and compared with the factor internal reliability coefficients obtained in original validation studies.

Covariate Variables

In this study, the variables of primary interest were six subfactors of self-regulated learning (intrinsic goal orientation, control of learning, self-efficacy for learning and performance, metacognitive self regulation, time and study resource management, and effort regulation) and five subfactors of epistemological beliefs (omniscient authority, certain knowledge, quick learning, simple knowledge, and innate ability). However, the literature suggests that self-efficacy for computer use, reason for taking an online course, and prior college academic achievement are positively correlated with success in Web-based learning. These variables, then, were considered as covariates in the model for the following reason: Although they were not the variables of primary interest in this study, they were expected to have an impact on the dependent variable.

The survey instrument included questions related to the covariates as follows: (a) two Likert-scaled question items were included that referenced the study participant's self-efficacy for computer usage, and (b) a short answer question item was included that referenced the study participant's reason(s) for taking the online course, and (c) each participant's grade-point average (GPA) was collected from university registration records. Permission to obtain this information was obtained from each study participant. Table 3 provides a listing of the covariates and how they were assessed.

Data Collection

Because the target sample for this study included "traditional" as opposed to "adult" undergraduates, data was collected for students enrolled in a variety of undergraduate Web-based courses designated as "on-campus" course sections. Students were contacted

Table 3
Covariates' Measurements

Covariate	Measure	How quantified
Self-efficacy for computer technology use	Response to 2 Likert-scaled question items. Scale: 1-5. 1: "Strongly disagree" to 5: "Strongly agree."	$\sum$ scores
Reason for taking the asynchronous online course	Open short answer question item: Why are you taking this course on-line as opposed to in a campus based classroom?	Keyed or categorized into themes

immediately after the schedule adjustment period at the beginning of the spring 2005 semester in order to recruit them for participation in the study.

A data collection instrument was created in SelectsurveyASP™ in order to accept real time data input. This instrument was located on the university Web server, and the link to that area was accessible only to study participants, IT tech support , and the researcher. Participants completed the Web-based form during the first two weeks of the spring 2005 semester. The survey form was in .xls, a format compatible with Microsoft Excel such that data could be downloaded from the Web environment and pasted in an Excel spreadsheet on the researcher's computer. Afterwards, this data was transferred from excel into SAS 9.1.3 for data analysis.

Data Analysis

The goal of this study was to investigate the influence of individual self-regulated learning (SRL) and epistemological beliefs (EB) on learner achievement in asynchronous Web-based undergraduate courses. The following steps describe how the data was analyzed to reveal the predictive ability of the subfactors of SRL and EB on academic achievement.

1. The first step was to run a factor analysis of both instruments (MSLQ and EBI) in order to establish the factor loadings of the question items. While it was expected that, overall, the results would match, some differences were found between the factor scales obtained in the original factor analyses with those conducted in the present study.
2. The next step was to generate a correlation matrix of the independent variables (the SRL and EBI factors derived from step one and the study covariates) and the dependent variable. An analysis of the matrix determined which of the independent variables were correlated with the dependent variable and which of the independent variables were correlated with each other. The intent was to determine the inter-relationships among the predictors so that there might be an indication beforehand regarding any problems of multi-collinearity or overlap among the predictors that could cause the modeling to be problematic.
3. Finally, a multiple regression analysis of the predictor variables in the proposed model with the dependent variable (final course grade as a measure of learning achievement) was performed.

After examining the overall performance of the model, attention was given to the individual contribution, if any, of each of the independent variables in the model. Individual tests were performed by analyzing the standardized beta coefficient value for each independent variable. If the p-value was less than .05, the ß coefficient was deemed to be significantly different from 0 at the 0.05 significance level which was strong evidence that that predictor contributed significant information about the final grade in the presence of the other predictors in the model.

Previous studies have described models of learner achievement in Web-based courses. The adjusted R^2 values that these models have yielded varied between .07 to .42. This may have occurred because some of the models did not include useful independent variables. Therefore, the current study model was considered successful if its adjusted R^2 was greater than the midpoint of these two values. However, models that have adjusted R^2 even smaller than 0.25 can still be considered valuable.

Summary

Learner achievement is a complex phenomenon and as such is most likely affected by several independent variables. In addition to descriptive statistics concerning the study sample, inferential statistics were generated in order to understand the extent to which SRL factors and dimensions of EB affected learning achievement in an asynchronous Web-based course. Multiple regression is an appropriate statistical procedure for developing a model to describe this phenomenon. It provided not only information about the predictive ability of individual variables, but also determined which independent variable(s) in the model were significant and contributed the most to explaining learner achievement.

Previous research into models of online learner achievement had not considered the joint contribution that self-regulated learning and epistemological beliefs may bring to a model of learner achievement in asynchronous Web-based instructional environments. This study is expected to contribute to the literature by explaining the relationship between self-regulated learning, epistemological beliefs and learner achievement in asynchronous Web-based courses.

CHAPTER IV: RESULTS

The purpose of this study was to examine the effects of subfactors of self-regulated learning (SRL) and epistemological beliefs (EB) on individual learner levels of academic achievement in an asynchronous Web-based learning environment while holding constant the effect of three covariate factors: (a) self-efficacy for using computer technology, (b), reason for taking an online course and (c) prior college academic achievement. The general question driving this study was: Are there factors of self-regulated learning and epistemological beliefs that can predict learner achievement in undergraduate asynchronous Web-based courses at institutions of higher learning? A total of 201 undergraduate students participated in the study.

This chapter presents descriptive and inferential analyses of the study data as related to the sample demographics and to the study's research question: What is the predictive ability of the following variables: self-regulated learning (intrinsic goal orientation, expectancy or control of learning, self-efficacy for learning and performance, metacognitive self-regulation, time and study resource management, effort regulation), epistemological beliefs (omniscient authority, certain knowledge, quick learning, simple knowledge, and innate ability), computer self-efficacy, reason for taking an online course, and prior college academic achievement on final grade in asynchronous undergraduate online college courses? The study sample demographics will be presented first; they then will be followed by a description of the the data analysis that was done in order to answer the study research question.

Sample Demographics

The site for the study was a coeducational public university situated in the southeastern region of the United States. An initial recruitment e-mail message and three follow-up emails (Appendix A) were sent to 629 undergraduate students who were registered in at least one asynchronous Web-based online course during the spring 2005 academic semester. A total of 219 students participated in the study by completing survey instruments, resulting in a 35% response rate. However, only 201 of the 219 completed surveys proved to be useable. Eighteen of the study participants either did not include responses to all of the self-rating question items or did not receive a final course grade. Therefore, these 18 survey responses were not used in this study. As a result, a 32% useable response rate was achieved.

Table 4 displays the descriptive statistics for the sample population. Most participants were female (77.1%), and the most common racial/ethnic groups were Non-Hispanic White (74.1%) or Non-Hispanic Black (16.4%). Students from all four class levels participated in this study, and juniors and seniors accounted for about two thirds (64.7%) of the sample. Final course grades ranged from 0–100 (M = 86.36, SD = 13.31) with 55.7% earning a grade of 90 or above. Grade point average (GPA) of the sample population ranged from 1.00–4.00 (M = 3.00, SD = 0.63). Student participants ranged in age from 18 to 50 years (M = 22.46, SD = 6.14).

Table 5 compares the study sample to the population of undergraduate students enrolled at the academic institution from which it was drawn. Compared to the institutional pool, the study sample was more diverse. For example, there were seven times as many Native American students and more students who characterized themselves as “mixed race” in the current sample than in the institution as a whole. There was an overall 60/40 split

Table 4
Descriptive Statistics for the Sample (N = 201)

	n	%
Gender		
Male	46	22.9
Female	155	77.1
Race/Ethnicity		
Native American	10	5.0
Asian/Pacific Islander	3	1.5
Non-Hispanic Black	33	16.4
Hispanic	1	0.5
Non-Hispanic White	149	74.1
Mixed Race	5	2.5
Class Level		
Freshman	28	13.9
Sophomore	43	21.4
Junior	57	28.4
Senior	73	36.3
Final Course Grade [a]		
0 - 69	12	6.0
70 - 79	24	11.9
80 - 89	53	26.4
90 - 94	68	33.8
95 - 100	44	21.9
Grade Point Average (GPA) [b]		
Under 2.00	12	6.0
2.00 - 2.99	81	40.2
3.00 - 3.49	54	26.9
3.50 - 4.00	54	26.9
Age [c]		
18 - 20 years	92	45.8
21 - 24 years	82	40.7
25 - 39 years	20	10.0
40 - 50 years	7	3.5

[a]Grade: $M = 86.36$, $SD = 13.31$. [b]GPA: $M = 3.00$, $SD = 0.63$. [c]Age: $M = 22.46$, $SD = 6.14$.

between female and male undergraduates at the study institution, with this gender gap even more apparent in the number of students taking Web-based courses. There were 2.4 times as many females (71%) compared to males (29%) enrolled in online courses at the university during the spring 2005 semester. This difference was slightly greater in the study sample drawn from this population, with about 3.3 times as many female (77%) as male students (23%) enrolled in online courses.

Table 5
Demographics of Study Sample Compared with all Undergraduates

Demographic	Study Sample: Spring 2005	All Undergrads: Fall 2004
Mean Age (years)	22.4	22.3
Ethnicity/Race (%)		
Native American	5.0	.7
Asian/Pacific Islander	1.5	2.3
Non-Hispanic Black	16.4	16.4
Hispanic	0 .5	1.6
Non-Hispanic White	74.1	78.6
Mixed race	2.5	–
Unknown and alien	–	1.7
Gender (%)		
Female	77.1	59.4
Male	22.9	40.6
Class Rank (%)		
Freshman	13.9	22.1
Sophomore	21.4	17.4
Junior	28.4	16.4
Senior	36.3	20.8
Unclassified	0	.5
GPA (0-4)		
Overall	3.0	2.81
Female	3.06	2.90
Male	2.78	2.69

Regarding the academic profile of the sample population, there were more junior and senior students (65%) than freshmen and sophomores (35%) who participated in the study. This may have occurred because most of the online courses offered during the semester were advanced level undergraduate courses appropriate for junior and senior year students. The average GPA of students in the study sample was slightly greater than that for all undergraduates at the institution, and the difference in the average GPA of female versus male students was slightly greater for the study sample (3.06 vs. 2.78) than for the general population of undergraduate online learners (2.90 vs. 2.69).

Table 6 profiles the sample population of students by their academic course of study. Course of study is identified based on the academic unit in which it is housed. 86.5% of the sample (n = 174) identified their major course of study as either a pre-professional or career oriented track outside of the arts and sciences or fine arts and communications; 3.4% did not specify a major course of study.

Table 6
Study Sample by Academic Unit/Major Course of Study (N = 201)

Academic Unit	N	%
College of Human Ecology	34	16.9
College of Education	32	15.9
School of Nursing	30	15
College of Business	28	14
College of Health & Human Performance	19	9.2
School of Allied Health Sciences	17	8.7
College of Arts and Sciences	17	8.7
College of Technology & Computer Science	14	6.8
College of Fine Arts and Communication	3	1.4
None	7	3.4
Total	201	100

Research Question

In order to answer the study's research question, it was first necessary to determine the factor structures for both the self-regulated learning and the epistemological beliefs items on the self-report inventory that was administered to undergraduate students taking online courses at a southeastern university (critical for determining reliability and validity). A description of the procedures used to determine the factor loadings for the self-regulated learning as well as the epistemological beliefs survey items follows.

Self-Regulated Learning

Pintrich and Smith (1993) claimed construct validity for the Motivated Strategies for Learning Questionnaire (MSLQ); however, while the original authors made this claim for their instrument, no clear evidence of an exploratory factor analysis ever having been conducted could be found in the literature. Therefore, it was decided to submit the self-regulated learning question items to an exploratory factor analysis. A factor analysis of the question items was also done for the following additional reasons: (a) only selected question items from the original instrument were used in the present study; (b) unlike the original validation studies, the question items in the present study were not administered in a classroom setting but rather on the World Wide Web; and (c) the sample of undergraduates in the current study differed from that used to validate the original instrument.

Before performing a factor analysis on the question item variables, Nunally and Bernstein (1994) and Pett, Lackey, and Sullivan (2003) recommend first examining the correlation matrix closely for item consistency and for the purpose of identifying items that may not intercorrelate sufficiently ($\leq .30$) with other question items in order to form a potential factor. If items are not correlated strongly enough, there will not be much shared common variance, which could result in yielding as many factors as items (Nunnally & Bernstein, 1994; Pett, Lackey, & Sullivan, 2003). Therefore, based on the correlation criteria mentioned above, items that did not correlate with all of the other question items for a particular variable were dropped. As a result, nine items were dropped from the initial set of question items. The correlation matrix for the self-regulated question items is presented in Table 7.

An exploratory factor analysis was performed using squared multiple correlations as prior communality estimates on the remaining 15 items. The researcher then used the principal factor method to extract the factors and followed with a promax (oblique) rotation. Both the scree test and the proportion of variance threshold of ≥10% suggested three meaningful factors. Therefore, they were the only factors retained for rotation.

When interpreting the rotated factor pattern, an item was said to load on a given factor if the factor loading was ≥.40 and < .30 for all other factors. As a result , _34_Exp was dropped because its primary factor loading on factor 1 was .30. If an item loaded on more than one factor, then it was dropped. Item _40_Expect was dropped for this reason because it loaded on both factors 1 and 3 (.42 and .38 respectively). Based on the minimum threshold loading level of .40 and the elimination of item 40_Expect, the following factor loadings were obtained: (a) four items were found to load on the first factor, which was subsequently labeled the expectancy factor; (b) six items loaded on the second factor, which was labeled the resource management factor; and (c) three items loaded on the third factor, which was labeled the intrinsic goal orientation factor. Questionnaire items, corresponding loadings, and the proportion of variance explained by each factor are presented in Table 8.

Table 7

Correlation Matrix of Self-Regulated Learning Question Items

	27_IGO	28_Expect	29_SE	30_Meta	31_TP	32_Effreg	33_IGO	34_Expect	35_SE	36_Meta	37_TP	38_Effreg
27_IGO	1											
28_Expect	0.22**	1										
29_SE	0.17*	0.42***	1									
30_Meta	0.05	0.20**	0.23**	1								
31_TP	0.02	0.34***	0.06	0.28***	1							
32_Effreg	0.15*	0.18**	0.21**	0.35***	0.23**	1						
33_IGO	0.24**	0.19**	0.01	0.03	0.11	-0.05	1					
34_Expect	0.02	0.37***	0.18**	0.06	0.07	-0.02	0.15*	1				
35_SE	0.17*	0.42***	0.7***	0.24***	0.13	0.16*	0.11	0.32***	1			
36_Meta	0.17*	0.39***	0.34***	0.2**	0.28***	0.24***	0.2**	0.26***	0.42***	1		
37_TP	0.24***	0.27***	0.35***	0.35***	0.22**	0.4***	0.08	0.13	0.39***	0.47***	1	
38_Effreg	0.16*	0.38***	0.37***	0.26***	0.33***	0.26***	0.18**	0.29***	0.43***	0.47***	0.59***	1
39_IGO	0.41***	0.26***	0.14	0.16*	0.2**	0.14*	0.2**	0.11	0.21**	0.41***	0.33***	0.38***
40_Expect	0.18**	0.48***	0.32***	0.15*	0.3***	0.12	0.22**	0.27***	0.49***	0.34***	0.35***	0.38***
41_SE	0.13	0.41***	0.77***	0.29***	0.15*	0.19	0.1	0.22**	0.75***	0.35***	0.36***	0.43***
42_Meta	0.26***	0.3***	0.43***	0.19**	0.14**	0.39***	0.09	0.12	0.35***	0.31***	0.36***	0.21***
43_TP	0.14*	0.14*	0.22**	0.3***	0.21**	0.56***	-0.12	0.005	0.2**	0.19**	0.42***	0.22***
44_Effreg	0.17*	0.32***	0.28***	0.35***	0.33***	0.22**	0.13	0.15*	0.29***	0.36***	0.43***	0.37***
45_IGO	0.30***	0.11	-0.02	-0.08	0.01	-0.09	0.24**	0.11	0.05	0.16*	0.12	0.03
46_Expect	-0.05	0.22**	0.09	-0.07	0.06	-0.03	0.13	0.23**	0.07	-0.04	-0.09	-0.05
47_SE	0.15*	0.47***	0.73***	0.34***	0.15*	0.14*	0.05	0.28***	0.71***	0.38***	0.34***	0.41***
48_Meta	0.04	0.2**	-0.003	0.08	0.28***	0.14*	0.17*	0.2**	0.16*	0.23***	0.23***	0.25***
49_TP	0.08	0.25***	0.34***	0.18**	0.22**	0.34***	-0.003	0.08	0.32***	0.32***	0.32***	0.39***
50_Effreg	0.2**	0.3***	0.21**	0.29***	0.32***	0.19**	0.07	0.18**	0.29***	0.39***	0.50***	0.51***

Table 7 (continued)

	39_IGO	40_Expect	41_SE	42_Meta	43_TP	44_Effreg	45_IGO	46_Expect	47_SE	48_Meta	49_TP	50_Effreg
39_IGO	1											
40_Expect	0.42***	1										
41_SE	0.24***	0.47***	1									
42_Meta	0.09	0.17*	0.39***	1								
43_TP	0.14	0.06	0.23***	0.49***	1							
44_Effreg	0.2**	0.29***	0.32***	0.47***	0.47***	1						
45_IGO	0.42***	0.16*	0.02	-0.1	-0.08	0.03	1					
46_Expect	-0.02	0.24**	0.11	0.01	-0.08	-0.15*	-0.003	1				
47_SE	0.11	0.43***	0.74***	0.43***	0.15*	0.38***	0.03	0.18*	1			
48_Meta	0.27***	0.22**	0.13	0.09	0.1	0.19*	0.14*	0.12	0.13	1		
49_TP	0.06	0.26	0.29***	0.31***	0.38***	0.51***	-0.04	-0.1	0.35***	0.04	1	
50_Effreg	0.39***	0.33***	0.23***	0.27***	0.31***	0.39***	0.15*	-0.04	0.3***	0.19**	0.31***	1

Table 8

Rotated Factor Pattern Matrix for the 13-Item SRL Questionnaire: Principal Axis Factoring with Promax Rotation

Self-Regulated Learning Items	Proportion of Variance Explained	Factors 1	2	3
1. Expectancy	.66			
If I study in appropriate ways then I will be able to learn the material in this course (_28_exp)		.46	.07	.21
I believe that I will receive an excellent grade in this course (_29_SE)		.86	0	-.08
I expect to do well in this course (_41_SE)		.85	-.01	.01
Considering the difficulty of this course, the on-line format, and my skills, I think that I'll do well in this class (_47_SE)		.88	.01	-.05
2. Resource Management	.20			
Make good use of study time for course (_37_TP)		.07	.58	.20
Work hard to do well even if not like what doing (_38_Effreg)		.24	.42	.22
Find it hard to stick to a study schedule (_43_TP)		-.13	.72	-.13
When course work is difficult, give up or only study easy parts (_44_Effreg)		.04	.70	-.05
Rarely find time for review notes or readings before an exam (__49_TP)		.10	.63	-.19
Even when course materials dull, manage to keep working until finished (_50_Effreg)		0	.50	.29
3. Intrinsic Goal Orientation	.14			
In a on-line course, prefer course material that really challenges me so I can learn new things (_27_IGO)		.05	.06	.42
The most satisfying thing for me is trying to understand the course content (_39_IGO)		.01	.03	.80
When I have the opportunity, I choose course assignments that I can learn from even if they don't guarantee a good grade. (_45_IGO)		0	-.20	.58

Epistemological Beliefs

Construct validity for the epistemological belief (EB) items was originally established by Schraw, Bendixen, and Dunkle (2002); however, it was decided to submit the epistemological beliefs question items to exploratory factor analysis for several reasons. The EB instrument was recently developed and, as such, had not been extensively used in research. Therefore, the instrument's developers (Schraw, Bendixen, & Dunkle, 2002) recommended that it be subjected to further validity testing. Furthermore, unlike in the original researchers' validation study, the question items were not administered in a classroom setting for this study; they were administered via the World Wide Web. Finally, the sample of undergraduates in the current study differed from that used to validate the original researchers' instrument.

Before performing a factor analysis on the question item variables, Nunally and Bernstein (1994) and Pett, Lackey, and Sullivan (2003) recommended first examining the correlation matrix closely for item consistency and identifying items that may not intercorrelate sufficiently (≤ .30) with other question items in order to form a potential factor. If items are not correlated strongly enough, there will not be much shared common variance, which could result in yielding as many factors as items (Nunnally & Bernstein, 1994; Pett, Lackey, & Sullivan, 2003). Therefore, based on the correlation criteria mentioned above, items that did not correlate with all of the other question items for a particular variable were dropped. As a result, eighteen items were dropped from the initial set of question items. The correlation matrix for the epistemological question items is presented in Table 9.

Table 9

Correlation Matrix of Epistemological Beliefs Question Items

	51_SK	52_CK	53_QL	54_OA	55_IA	56_CK	57_OA	58_IA	59_QL	60_SK	61_SK	62_IA	63_SK	64_CK	65_IA
51_SK	1														
52_CK	0.35***	1													
53_QL	-0.02	-0.08	1												
54_OA	0.02	0.04	-0.0008	1											
55_IA	-0.001	-0.14*	0.31***	-0.16*	1										
56_CK	-0.1	0.09	-0.13	0.24**	-0.17*	1									
57_OA	0.02	-0.03	0.05	0.18*	-0.08	0.08	1								
58_IA	0.01	-0.17*	0.33***	-0.02	0.3***	-0.14*	-0.14*	1							
59_QL	0.08	-0.1	0.1	0.06	-0.008	-0.04	-0.02	0.29***	1						
60_SK	0.04	-0.04	0.03	0.01	0.14	0.0004	0.01	0.17*	0.42***	1					
61_SK	0.18*	-0.23**	-0.06	0.1	-0.04	-0.09	0.05	0.08	0.16*	0.15*	1				
62_IA	0.06	-0.11	0.18**	0.03	0.24**	-0.18**	0.14*	0.22**	0.12	0.25**	0.05	1			
63_SK	0.1	-0.01	0.08	0.1	0.08	-0.02	0.01	0.11	0.26**	0.48***	0.14*	0.31***	1		
64_CK	0.005	0.14	-0.01	0.08	-0.1	0.08	0.003	-0.05	0.1	0.31***	-0.07	0.03	0.34***	1	
65_IA	-0.05	0.005	0.33***	0.01	0.39***	-0.06	0.1	0.29***	0.05	0.18**	-0.14*	0.26***	0.11	-0.04	1
66_QL	-0.09	0.05	0.24**	-0.09	0.35***	-0.23**	-0.01	0.15*	0.12	0.13	-0.04	0.33***	0.14*	-0.09*	0.53***
67_IA	0.12	-0.11	0.18**	-0.05	0.42***	-0.1	-0.07	0.34***	0.05	0.14*	0.06	0.36***	0.15*	0.03	0.34***
68_SK	0.02	-0.09	-0.06	0.1	0.09	0.01	0.11	-0.01	0.29***	0.31***	0.21**	0.04	0.3***	0.03	-0.003
69_CK	-0.17*	0.06	0.13	0.04	0.15*	0.03	0.18**	0.06	0.18**	0.22**	0.13	0.13	0.14*	-0.02	0.22**
70_OA	0.05	0.15*	-0.17*	0.16*	-0.13	0.17*	0.08	-0.04	-0.01	0.02	0.01	-0.07	0.07	0.13	-0.09
71_QL	-0.07	0.01	0.17*	-0.01	0.16*	-0.03	0.09	0.03	0.1	0.15*	-0.005	0.24***	0.15*	0.06	0.21**
72_CK	-0.07	0.07	0.09	0.002	-0.02	-0.1	0.05	-0.05	0.05	0.1	0.12	0.13	0.03	-0.08	0.03
73_CK	-0.07	0.17*	0.08	0.11	0.03	0.07	0.2**	-0.05	0.05	0.21**	0.01	0.1	0.13	0.07	0.23***
74_SK	-0.15*	0.16*	0.04	-0.04	0.01	0.02	-0.13	-0.05	-0.07	0.05	-0.14*	0.06	0.1	0.14	-0.07
75_CK	-0.1	0.15*	0.21**	0.17*	0.05	0.02	0.2**	0.1	0.2**	0.14*	0.01	0.15*	0.13	0.02	0.29***
76_IA	-0.12	0.03	0.22**	-0.04	0.41***	-0.004	-0.02	0.32***	0.08	0.12	-0.0004	0.23**	0.04	-0.06	0.34***

Table 9 (continued)

	51_SK	52_CK	53_QL	54_OA	55_IA	56_CK	57_OA	58_IA	59_QL	60_SK	61_SK	62_IA	63_SK	64_CK	65_IA
77_OA	0.06	0.03	0.01	0.29***	-0.03	0.06	-0.04	0.05	0.17**	0.1	0.09	-0.1	0.2**	0.1	0.05
78_OA	-0.001	0.19**	-0.00004	0.3***	-0.05	0.09	0.13	0.09	0.06	0.14*	-0.02	0.12	0.23**	0.09	0.26***
79_QL	-0.12	0.08	0.23***	0.02	0.17*	-0.04	0.09	0.08	0.15*	0.25***	-0.07*	0.27***	0.27***	0.1	0.27***
80_SK	-0.12	0.1	-0.007	0.16*	-0.04	0.05	-0.08	-0.13	-0.16*	-0.09	-0.11	0.08	-0.09	0.04	-0.16*
81_CK	-0.14*	0.06	0.06	0.07	-0.08	0.24***	-0.01	-0.08	-0.01	-0.07	-0.17*	0.07	0.03	0.08	-0.1
82_IA	0.15*	-0.09	-0.09	0.02	0.04	0.06	0.002	0.11	0.04	0.09	0.14	-0.05*	0.03	0.003	0.01

	66_QL	67_IA	68_SK	69_CK	70_OA	71_QL	72_CK	73_CK	74_SK	75_CK	76_IA	77_OA	78_OA	79_QL	80_SK	81_CK	82_IA
66_QL	1																
67_IA	0.24***	1															
68_SK	0.09	0.13	1														
69_CK	0.31***	-0.04	0.13	1													
70_OA	-0.11	-0.02	0.09	-0.01	1												
71_QL	0.42***	0.04	0.07	0.22**	-0.07	1											
72_CK	0.1	0.01	0.05	0.05	-0.12	0.11	1										
73_CK	0.21**	-0.04	0.08	0.18**	0.04	0.17*	0.23**	1									
74_SK	0.05	-0.09	-0.08	-0.00	0.06	0.16*	-0.19**	-0.06	1								
75_CK	0.22**	0.04	0.06	0.21**	0.1	0.18*	0.17*	0.2**	-0.07	1							
76_IA	0.26***	0.28***	0.04	0.14*	-0.07	0.18*	0.03	0.23**	-07	0.21**	1						
77_OA	-0.09	0.1	0.22**	0.06	0.13	0.02	0.02	0.08	-0.07	0.18	-0.006	1					
78_OA	0.28***	0.13	0.08	0.29***	0.23**	0.16*	0.09	0.23**	0.02	0.23**	0.05	0.35***	1				
79_QL	0.4***	0.07	0.11	0.36***	-0.05	0.47***	0.11	0.21**	0.18**	0.28***	0.14	0.04	0.25**	1			
80_SK	0.02	-0.19**	-0.12	-0.04	0.11	-0.1	-0.04	0.04	0.08	-0.001	-0.05	-0.09	-0.04	0.0005	1		
81_CK	-0.01	-0.15*	-0.16*	0.08	0.11	0.01	-0.03	0.14	0.18*	0.17*	-0.007	-0.10	0.08	0.11	0.29***	1	
82_IA	-0.14*	0.22**	0.1	-0.06	0.05	-0.06	-0.04	-0.01	-0.15*	-0.06	0.13	0.18*	-0.06	-0.10	-0.20**	-0.30***	1

An exploratory factor analysis was performed using squared multiple correlations as prior communality estimates on the remaining 14 items. The principal factor method was used to extract the factors, and this was followed by a promax (oblique) rotation. Both the scree test and the proportion of variance threshold of ≥10% suggested four meaningful factors. Therefore, they were the only factors retained for rotation.

When interpreting the rotated factor pattern, an item was said to load on a given factor if the factor loading was ≥ .40 and < .30 for all other items. There was one exception to this condition: _68_SK. In the case of item _68_SK, it's factor loading on factor 3 was less than .40. However, it was retained because its coefficient was close to .40 (.37) and it's loadings for the other three factors were less than .15.

Based on the minimum threshold loading level of .40 plus the inclusion of item _68_SK, the following factor loadings were obtained: (a) five items were found to load on the first factor, which was subsequently labeled the "Innate Ability"; (b) three items loaded on the second factor, which was labeled "Quick Learning"; (c) three items loaded on the third factor which was labeled "Simple Knowledge"; and (d) three items loaded on the fourth factor, which was labeled "Omniscient Authority." Questionnaire items and corresponding loadings are presented in Table 10.

Covariate: Computer Self-Efficacy

Students reported their ability to use computer technology by responding to two Likert-scaled questions. One question item asked respondents about their ability to use technology such as the Internet, e-mail, and chat, while the other question item asked repondents to describe how they felt about their ability to overcome computer and

Table 10

Rotated Factor Pattern Matrix for the 14 Item EB Questionnaire: Principal Axis Factoring with Promax Rotation.

Epistemological Belief Items	Proportion of Variance Explained	Factors 1	2	3	4
1. Innate Ability	.49				
Some people will never be smart no matter how hard they work (55_IA)		.66	.07	.06	-.23
Really smart students don't have to work as hard to do well in school (58_IA)		.55	-.13	.06	.05
How well you do in school depends on how smart you are (65_IA)		.51	.29	-.12	.14
Some people just have a knack for learning and others don't (67_IA)		.66	-.15	.09	.07
Smart people are born that way (76_IA)		.53	.06	-.01	-.06
2. Quick Learning	.23				
If you don't learn something quickly, you'll never learn it (66_QL)		.23	.66	-.10	-.02
If you haven't understood a chapter the first time through, going back over it won't help (71_QL)		-.12	.67	.07	-.07
Working on a problem with no quick solution is a waste of time (79_QL)		-.11	.66	.19	-.01
3. Simple Knowledge	.15				
Too many theories just complicate things (60_SK)		.10	.10	.56	-.04
Instructors should focus on facts instead of theories (63_SK)		-.01	.09	.73	.08
Things are simpler than most professors would have you believe (68_SK)		.03	-.02	.37	.09
4. Omniscient Authority	.12				
People should always obey the law (54_OA)		-.10	-.07	.03	.41
When someone in authority tells me what to do, I usually do it(77_OA)		.06	-.18	.16	.51
People who question authority are troublemakers (78_OA)		.01	.23	-.04	.69

technology-related problems. The responses for each question were added together and the sum represented the student's overall self-report score for computer self-efficacy (M=6.38, S.D.=1.18). The correlation between computer self-efficacy and final grade was not significant (r = .09; see Table 11).

Covariate: Reason for Taking an Online Course

Survey participants fell into three categories according to their reason for taking an online course during the Spring, 2005 semester. 47.8 % of respondents to this question (n=96) stated that learning online was more convenient for them than taking a traditional face-to-face course. 33.8 % (n=68) of study subjects reported that they had no option. "No option" meant that at the time the student registered, either the course was only offered online or there were no face-to-face course sections available. 18.4 % (n=37) of respondents gave a reason related to their curiosity or interest in learning via the electronic medium. Table 12 displays final grade based on reason for taking the course.

Covariate: Prior Academic Achievement

Prior academic college achievement was measured using the current semester grade point average. The mean GPA for the sample was 3.01 and the S.D. 0.63 (see Table 11).

Interaction Term

The research literature is rich with references to the positive relationship that exists between prior academic achievement (GPA) and expectancy for learning (Bandura, 1986, 1997; Pajares, 2002; VanZile-Tamsen, 2001; Zimmermann, 1994, 1998). Furthermore, in the current study, these two variables were found to be moderately correlated (r = .3) (see Table 11). Therefore, given this r value as well as the rationale offered by previous literature,

Table 11

Means, Standard Deviations, Intercorrelations, and Coefficient Alpha Reliability Estimates

Variable	M	SD	1	2	3	4	5	6	7	8	9	10
Final Grade	86.36	13.31										
GPA	3.01	0.63	.40***									
Computer Self-Efficacy	6.38	1.18	-.09	-.25***	(70)							
Intrinsic Goal Orientation	13.11	3.11	.10	.03	.07	(62)[74]						
Eff/Resource Management	30.83	6.02	.32***	.25***	.09	.28***	(80)[73]					
Expectancy	23.50	3.88	.39***	.30***	.10	.23**	.50***	(85)[81]				
Quick Learning	4.88	1.90	-.16*	-.23***	-.08	-.20	-.43***	-.34***	(67)[58]			
Innate Ability	13.10	3.82	-.007	.05	-.04	-.19**	-.22**	-.11	.35***	(72)[62]		
Omniscient Authority	10.36	2.05	.05	-.06	-.06	.03	.17*	.08	.09	.03	(55)[68]	
Simple Knowledge	9.49	2.26	-.03	-.02	-.02	-.14*	-25***	-.11	.26***	.21**	.25***	(60)[62]
GPAXExpectancy	71.08	20.56	.52***	.84***	-.13	.15*	.45***	.66***	-.35***	-.03	-.006	-.08

Note. N = 201. Reliability estimates appear on the diagonal. Estimates in parentheses are for the current sample after factor analysis, those in brackets are from original researchers' instruments.

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

Table 12
Final Grade Based on Reason for Taking the Course (N = 201)

Reason	*n*	*M*	*SD*	Low	High
Convenience	96	84.83	15.97	0	100
No Other Option	68	87.75	8.46	63	100
Interest in Online Learning	37	87.78	12.86	31	99

it was decided to create an interaction term by taking the cross product of the variable that measured prior college academic achievement (GPA) and the variable that measured individual expectancy for learning (ExpSE_sum) and include it in the predictive model (Jaccard & Turrisi, 2003). This new variable was labeled GPA_Exp.

Mean standard deviations, Pearson correlations and coefficient alpha reliability estimates for the study's independent variables appear in Table 11. Coefficients ≥.1 were considered indicative of a correlation between a particular predictor variable and the dependent variable. Therefore, based on this criterion, the following bivariate correlations revealed five predictor variables significantly related to learning achievement: (a) interaction of GPA and expectancy ($r = .52$), (b) prior college achievement as measured by GPA ($r = .40$), (c) expectancy ($r = .39$), (d) effort regulation ($r = .32$), and (e) quick learning ($r = -.16$). All of these correlations were significant at least at $p < .05$, and all were in the predicted directions.

Study Research Question

The research question guiding this study was: What is the predictive ability of the following variables: (a) self-regulated learning (expectancy for learning, intrinsic goal orientation, and resource management); (b) epistemological beliefs (quick learning, innate ability, omniscient authority, and simple knowledge); (c) computer self-efficacy; (d) reason for taking an online course; (e) prior college academic achievement (GPA); and (f) the interaction of prior college academic achievement with expectancy for learning (GPA_Exp) on final grade in asynchronous undergraduate online college courses?

Using multiple regression, final course grades were regressed on the linear combination of all the variables in the model. These eleven variables included: (a) prior academic achievement (GPA), (b) computer self-efficacy (Comp_SE), (c) intrinsic goal orientation (IGO_sum), (d) resource management (TPEffreg), (e) expectancy (ExpSE_sum), (f) quick learning (QL_sum), (g) innate ability (IA_sum), (h) omniscient authority (OA_sum), (i) simple knowledge (SK_sum), (j) reason for taking an online course (reason_ol), and (k) the interaction between GPA and expectancy (GPA_Exp). Table 13 depicts the prediction of final grade based on the full model.

The linear combination of these eleven variables accounted for 35% of the variance in learning achievement as measured by final course grade in asynchronous undergraduate online courses (Table 13). In other words, the linear combination of the independent variables significantly predicted final course grade in asynchronous undergraduate online courses (adj. $R^2 = .35$, $p < .001$). Three of the eleven independent variables were significant ($P < .0001$) predictors of undergraduate learning achievement in asynchronous online courses; these predictors were prior college learning achievement (GPA), expectancy for learning

(ExpSE_sum), and the interaction of prior college learning achievement with expectancy for learning (GPA_Exp).

The magnitude of contribution for each significant predictor was determined by its associated standardized regression coefficient (Table 13; they were GPA (2.2, p<.0001), expectancy (1.7, p<.0001), and GPA_Exp (-2.4, p<.0001). The differences between the absolute values for these three coefficients did not appear to be widely divergent. In fact, if rounded to the nearest whole integer they would all be equal. Thus, it appeared that neither of these three independent variables had a greater effect than the others in predicting the dependent variable.

Table 13
Prediction of Final Grade Based on the Full Model (N = 201)

	b	SE	β	*t*	*p*
Intercept	-80.93	27.82		-2.91	.004
Grade point average	45.23	9.08	2.15	4.98	.0001
Computer self-efficacy	-0.11	0.69	-.01	-0.16	.87
Intrinsic goal orientation	-0.10	0.26	-.02	-0.38	.70
Resource management	0.16	0.17	.07	0.98	.33
Expectancy	5.84	1.08	1.70	5.40	.0001
Quick learning	0.67	0.49	.10	1.36	.18
Innate ability	-.10	0.22	-.03	-0.44	.66
Omniscient authority	0.02	0.40	.003	0.05	.96
Simple knowledge	0.09	0.37	.02	0.25	.80
Reason_ol	-2.24	1.53	-.08	-1.46	.14
Grade point average X Expectancy	-1.56	0.36	-2.41	-4.28	.0001

Full Model: F (11, 189) = 10.98, p = .0001. adj R^2 = .354)

Interaction term. Figure 2 compares the relationship between the independent variable (Exp) and the dependent variable (Fin Gr) where GPA is low (below the median) and where GPA is high (above the median). This figure demonstrates that when GPA is below the median, the slope of expectancy for learning on FinGr is steeper than when GPA is equal to or greater than the median. This suggests that expectancy for learning exerts a greater effect at lower values of GPA than it does at higher values of GPA. Furthermore, this figure also suggests that GPA's impact on final course grade is mitigated at higher levels of expectancy for learning.

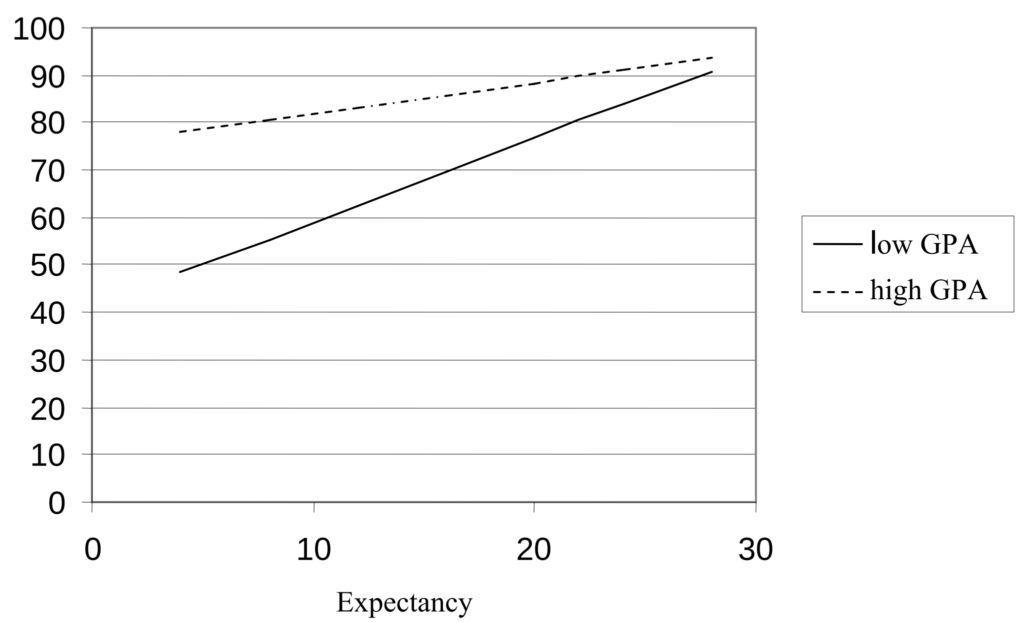


Figure 2. Relationship of Expectancy and Final Grade where GPA is low (below the median) and where GPA is high (at or above the median)

Summary

This chapter presented descriptive and inferential analyses of the data used to determine the predictive order of individual levels of self-regulated learning (SRL) and epistemological beliefs (EB) on learning achievement (final course grade) in asynchronous Web-based undergraduate courses. Data were collected on student demographic characteristics, self-regulated learning, epistemological beliefs, confidence level for computer technology use, and reason for taking an online course in order to provide answers to the study research questions.

Data analysis techniques such as factor analysis, bivariate correlation, and multiple regression were all used in order to discover which independent variables would be most successful as predictors of learning achievement in Web-based online undergraduate courses. Factor analysis was done first in order to determine on which subfactors of self-regulated learning and epistemological beliefs the individual question items loaded. Next, bivariate correlational analyses of the self-regulated learning and epistemological beliefs subfactors yielded by factor analyses, the covariates (computer use, reason for taking an online course, and prior college achievement as measured by GPA), and the dependent variable (learning achievement as measured by final course grade) were performed in order to determine the intercorrelational relationships among the variables. Based on the literature and the intercorrelation between GPA and ExpSE_sum, an interaction term consisting of the product between GPA and ExpSE_sum was created and added to the predictive model. Then, the variables were placed in the linear regression model and it was interpreted in order to determine which of the independent variables were predictors of learning achievement. Chapter five will provide an in-depth discussion of the results presented in this chapter as well as the implications of this study's findings for online undergraduate learning environments.

CHAPTER V: DISCUSSION

This chapter will explain the significance of the study findings and place them in the context of the literature and suggest directions for future research in asynchronous Web-based learning (AWBL). Furthermore, it will make recommendations for educational researchers and practitioners who teach online as well as those who direct higher education policy. Lastly, it will suggest how the study's findings can be used to help prepare students for success as learners in higher educational settings and as continuing lifelong learners.The purpose of this study was to examine the effect of self-regulated learning (SRL) and expistemological beliefs (EB) on individual levels of achievement in an asynchronous Web-based learning environment while controlling for the effects of three covariate factors: (a) reason for taking an online course and (b) self-efficacy for using computer technology, and (c) prior college academic achievement.

The original research question for this study was: What is the predictive ability of self-regulated learning (intrinsic goal orientation, expectancy or control of learning, self-efficacy for learning and performance, metacognitive self-regulation, time and study resource management, effort regulation); epistemological beliefs (omniscient authority, certain knowledge, quick learning, simple knowledge, and innate ability); computer self-efficacy, reason for taking an online course, and prior academic achievement (GPA) on final grade in asynchronous undergraduate online college courses.

The survey question items related to self-regulated learning (SRL) and epistemological beliefs (EB) were taken from two previously designed research questionnaires: (a) the MSLQ, measured self-regulated learning subfactors and (b) the EBI, measured epistemological belief subfactors. No published exploratory factor analysis was found for the self-regulated learning subfactors. While there were published findings for a confirmatory factor analysis of the MSLQ, these findings were ambiguous (Pintrich & Smith, 1993). On the other hand, the developers of the EBI described their development of the EBI, and because they considered its validation as ongoing, they strongly advised that further studies be undertaken in order to confirm its validity. Therefore, it was decided to perform exploratory factor analyses on both the self-regulated learning and epistemological beliefs question items in the research questionnaire in order to determine their factor structures in this study.

Table 14 compares the resultant factor structures for the current study's SRL and EB question items to the factor structures obtained for the same question items by the developers of the original instruments.

Table 14
Resultant SRL and EB Factor Structures

Factor Structure: Original SRL	Factor Structure: Study's SRL Items
Intrinsic goal orientation	Intrinsic goal orientation
Self -Efficacy	Expectancy for control of learning (self-efficacy + expectancy)
Expectancy for control of learning	
Effort regulation	Resource management (effort regulation + time and place mngmnt)
Time and place resource management	
Metacognitive self regulation	Did not load on a discrete factor
Factor Structure: Original EBI	**Factor Structure: Study's EB Items**
Innate ability	Innate ability
Quick learning	Quick learning
Simple knowledge	Simple knowledge
Omniscient authority	Omniscient authority
Certain knowledge	Did not load on a discrete factor

Based on the resultant factor structures for the self-regulated learning and epistemological beliefs question items used in this study, the original research question was modified as follows: What is the predictive ability of the following variables: self-regulated learning (intrinsic goal orientation, expectancy or control of learning, resource management), epistemological beliefs (omniscient authority, quick learning, simple knowledge, and innate ability), computer self-efficacy, reason for taking an online course, and prior college academic achievement on final grade in asynchronous undergraduate online college courses? This research question drove the rest of the current research study.

The Research Model

A discussion of the findings for the dependent as well as for each of the independent variables in the model follows.

Dependent Variable: Final Course Grade

Final course grade was used as the measure of course learning achievement in this study. There is much precedent for using final course grade in studies of learning achievement. In fact, most of the previous research involving learning in AWBL environments has used either final course grade or the grade earned on a specific task as a measure of learning achievement (Bell, 2001; Chen, 2002; Garavilia & Gredler, 2002; Peng, 2003; Wang & Newlin, 2002b).

For this study's sample, 82 % of the final recoreded course grades were at least a "B." This distribution of grades was similar for the total population from which the study sample was taken (all on-campus students taking online courses). In that group, 79% of grades were at least a "B." Final course grades, then, were negatively skewed for both the study sample and the total on-campus population of undergraduates taking online courses. This lack of heterogeneity or variance in the sample grade distribution may have influenced the regression results for the sample such that some of the independent variables did not correlate with the dependent variable.

Independent Variables

Self-regulated learning subfactors. While factor analysis of the SRL survey question items yielded three SRL subfactors,only one turned out to be a significant predictor of learning achievement in AWBL.

Regarding the subfactor expectancy for control of learning (ExpSE_sum), four question items loaded on the subfactor called “Expectancy for control of learning.” Three out of four question items belonging to the original instrument’s self-efficacy factor and one out of four question items belonging to the original instrument’s expectancy for control of learning factor loaded onto one common factor. Refer to Table 8 for a listing of the survey question items that loaded on the expectancy for control of learning subfactor. In this study, the subfactor was dubbed “expectancy” and will be referred to as such from this point on.

Expectancy refers to a student’s belief that his efforts to learn result in positive outcomes and that learning outcomes are contingent upon one’s own efforts, rather than on the teacher. Holding positive beliefs about learning outcomes is a function of self-efficacy or judgments about one’s ability to accomplish a task as well as confidence in one’s skills to perform well. Thus, the study subfactor structure differed from the original factor structure of the MSLQ instrument because it combined expectancy for control of learning and self-efficacy into one subfactor called expectancy. This is because expectancy for learning would appear to depend on harboring positive beliefs about one’s ability to accomplish learning as well as about one’s ability to control the positive outcomes of one’s learning, such as the successful completion of an undergraduate course. The reliability coefficient for the new subfactor dubbed expectancy was $\alpha = .85$. This was higher than the combined mean of the original two factors (control of learning beliefs and self-efficacy $\bar{x} = .81$). Furthermore, it is noteworthy that this factor was the only self-regulated learning subfactor to appear as a significant predictor in the study's predictive model that explained learning achievement in undergraduate AWBL courses ($b=5.84$, $\beta=.1.70$ $t= -5.40$, $p<.0001$).

Expectancy for learning (self-efficacy and the belief that one controls one's success in learning) is an important factor that has been previously demonstrated to be correlated with learning achievement in studies of traditional or classroom-based learning environments (Bandura, 1997; Boekarts, Pintrich & Zeidner, 2000; Chen, 2002; Pintrich, Smith, Garcia, & McKeachie, 1991; Zimmermann, 2000). Moreover, similar to other studies conducted with college undergraduates enrolled in Web-based online courses, this study also found that those students who demonstrated greater expectancy than others tended to earn the higher end of course grades (McManus, 2000; Williams & Hellman, 2004). Finally, in the current study, the correlation between expectancy and learning achievement was $r = .39$. In the current study, three out of four survey question items that loaded on the expectancy subfactor were related to self-efficacy for learning. A meta-analysis of 11 studies concerning the relation between college students' sense of self-efficacy and their academic performance, (Multon, Brown, & Lent [1991] as cited in Kuh, Kinzie, Schuh, Whitt, & Associates, 2005) reported an average effect size (unbiased correlation) of .35. Thus, the current study's finding concerning student expectancy for success in college course learning was consistent with what pevious research found in conventional face-to-face learning environments as well as in asynchronous online learning environments.

Regarding the intrinsic goal orientation (IGO) subfactor, three out of four of the MSLQ question items belonging to the IGO subfactor loaded on the same factor in the current study's exploratory factor analysis. Refer to Table 8 for a listing of the survey question items that loaded on the intinsic goal orientation subfactor.

In this study the factor structure for IGO question items was similar to that of the original MSLQ instrument. While IGO was not a significant predictor in the proposed model ($b=-.10$, $\beta=-.02$, $t= -.38$, $p=.70$), and was not a significant correlate with final course grade, it did correlate mildly to moderately with other SRL subfactors. This will be addressed later in the section titled, "Intercorrelations of Independent Variables."

IGO refers to the degree that a student is motivated to participate in a course for reasons such as challenge, curiosity, and mastery. For example, taking a course is an end in itself rather than a means to an end and intrinsically goal-oriented individuals are motivated by the challenge of mastering a skill or learning course content material. This contrasts with extrinsic goal orientation where individuals are motivated by the prospect of earning a high grade or winning an award. Such individuals are said to be more concerned with performing well as opposed to mastering the learning goal. The tendency of an individual to be intrinsically rather than extrinsically motivated is associated with a greater likelihood of self regulating one's learning (Boekarts, 1997; Isaacson & Fujita, 2001; Pintrich, 2000; Zimmermann,1989b).

Regarding the resource management (Effreg_sum) subfactor, six question items from the original instrument loaded on the factor named "Resource management." Three of the question items came from the effort regulation factor and three from the time and place resource management factor. Refer to Table 4 for a listing of the survey question items that loaded on the resource management subfactor.

Time and place resource management refers to a student's ability to manage and regulate time and study environments, and effort regulation refers to her ability to control effort and attention in the face of distractions and uninteresting tasks. Thus, the study subfactor differed from the original factor structure of the MSLQ instrument because it combined both subfactors into one and called it "resource management." However, this structure intuitively makes good sense as resource regulation would appear to involve managing external factors such as time and place management as well as internal resources such as one's own effort and concentration. In fact, the combination of these two factors into a new subfactor labeled "resource management" had a greater reliability coefficient (α =.80) compared to either the time and place resource management subfactor (α = .76) or the effort regulation subfactor (α = .69) alone. Despite this improvement in reliabilty, this variable was not a predictor in the study model of learning achievement (b=.16, β=.07, t= .98, p=.33). This finding contrasts with what Chen (2002) found in her study of undergraduates taking an information systems course where effort regulation was indeed a significant predictor of student learning achievement in the course. However, unlike in the present study, her model did not include expectancy for learning. Thus, it may be that the presence of expectancy in the same model with effort regulation may have affected the model such that effort regulation was no longer a predictor of learning achievement in undergraduate AWBL environment. This finding will be discussed further in the later section devoted to explaining the multiple regression results. On the other hand, despite not making it into the predictive model, this variable did show mild to moderate correlation with the dependent variable ($r = .32, p<.001$).

This coincides with other previous theoretical and empirical research that identified effort regulation as a self-regulated learning factor associated with learning achievement (Chen, 2002; Garavilia & Gredler, 2002; Hofer, Yu, & Pintrich, 1998; Pintrich, Mckeachie, & Garcia, 1991; Zimmermann, 2000). For example, in Garavilia and Gredler's (2002) study with undergraduate psychology students in traditional classroom-based courses, planning and organization for the use of resource management and effort regulation were associated with learning achievement as measured by final course grade. Furthermore, the finding that effort regulation and final course grade were associated in the present study was also consistent with what Chen (2002) found with college undergraduates in a computer information processing course. In addition to correlating with the dependent variable, effort regulation also correlated with other independent variables in the predictive model. These intercorrelations will be discussed below in the section entitled "Intercorrelations of the Independent Variables."

Epistemological beliefs subfactors. None of the EB subfactors yielded by the study's factor analysis made it into the predictive model of learning achievement in asynchronous undergraduate online courses. Despite this finding, a discussion of the epistemological belief subfactors in the study's predictive model follows.

In the current study, three of the original instrument's five question items loaded on the quick learning (QL) subfactor. Refer to Table 10 for a listing of the survey question items that loaded on the quick learning subfactor. QL purports to measure an individual's belief that learning either occurs in a rapid fashion or it doesn't occur at all. Despite fewer question items loading on this subfactor, its reliability coefficient (α=.67) was greater than its reliability score (α = .58) in the original insrument. QL did mildly correlate with the dependent variable ($r = -.16$, $p<.05$). This finding replicates what previous research had found with college undergraduates and graduate students. That is, individual students who tended to believe in quick learning also tended to earn lower grades than other students. The exception to this finding was in Bendixen & Hartley's (2003) study with undergraduate teacher education students who completed an online reading comprehension task. In their study, the dependent variable was not final course grade but rather a performance measure on a timed reading comprehension task. Unlike in past studies, QL was positively rather than negatively associated with learning achievement in their study. This may have happened because students who believed that learning should be rapid might have had an advantage over other individuals in a time-dependent task. However, in the present study where the dependent measure was final course grade for a semester long course, QL was negatively correlated with learning achievement. This finding coincided with other studies that looked at the relationship between quick learning and learning achievement for semester length undergraduate courses (Schommer, 2001; Peng, 2003).

Despite its significant association with final course grade, this variable was not a predictor in the model explaining variance in final course grade in asynchronous undergraduate online courses ($b=.67$, $\beta=.10$, $t= 1.36$, $p=.18$). Again the reasons for why this may have occurred will be addressed later.

In the current study, five of the seven question items in the original instrument loaded on the innate ability (IA) subfactor. Refer to Table 10 for a listing of the survey question items that loaded on the innate ability subfactor. IA is a measure of one's belief that the ability to acquire knowledge and learn is a trait endowed at birth rather than a skill that one can develop and hone with practice. While fewer question items loaded on this subfactor, its reliability coefficient (α=.72) was greater than its reliability score (α = .62) in the original insrument. This subfactor was not associated with the study's dependent variable, nor was it a predictor in the linear model explaining learning achievement (b=-.10, β=.-.03, t= -.44, p=.66). However, it was associated with three of the SRL subfactors. A discussion of the intercorrelations among the SRL and epistemological belief subfactors will be addressed below in the section entitled "Intercorrelations of the Independent Variables."

In this study, three out of the five question items from the original instrument loaded on the omniscient authority (OA) subfactor. Refer to Table 10 for a listing of the survey question items that loaded on the omniscient authority subfactor. This subfactor measures one's belief that authorities have access to otherwise inaccessible knowledge and that learning consists principally of receiving this knowledge from these authorities. In the case of this subfactor, the lower number of question items resulted in a lower reliability coefficient (α = .55) than in the original instrument (α = .68). It neither correlated with the study's dependent variable nor was it a predictor in the final predictive model (b=.02., β=.003, t=.05, p=.96). The OA subfactor only exhibited mild correlations with one SRL subfactor. As already mentioned, this will be addressed in the section entitled "Intercorrelations of the Independent variables."

In this study, three out of seven of the original instrument's question items related to simple knowledge (SK) loaded together as one subfactor labeled SK. Refer to Table 10 for a listing of the survey question items that loaded on the simple knowledge subfactor. Despite fewer question items, the reliability coefficient for this study's subfactor (α = .60) was close to the reliability coefficient (α = .62) in the original instrument. As with IA and OA, it too failed to correlate with the study's dependent variable and was not a predictor variable in the study’s learning achievement model (b=-.09, β=.02, t=.25, p=.80). On the other hand, the SK subfactor exhibited interesting associations with three of the SRL subfactors. These associations will be discussed along with the other noteworthy associations for the other EB subfactors mentioned above.

Although the theoretical research literature concerning epistemological beliefs makes a strong case for the connection between subfactors of epistemological beliefs and learning achievement, in this study only one subfactor, quick learning, was correlated with final course grade. Moreover, the study’s predictive model of learning achievement contained no subfactors belonging to epistemological beliefs.

Covariate Variables

There were also three covariate variables in the predictive model of learning achievement in asynchronous online undergraduate courses. They included previous academic achievement (GPA), self-efficacy for computer technology (Comp_SE) and reason for taking an online course (reason_ol).

Previous learning achievement (GPA). In this study, previous undergraduate learning achievement was represented by the student’s fall 2005 GPA score. This measure, taken from institutional registrar records, was a significant predictor in the study’s model of online course learning achievement (b= 45.23, β=2.15, t=4.98, p<.0001). This finding supports similar research demonstrating the importance of prior academic achievement on subsequent learning achievement (Bendixen & Hartley, 2003; Camara & Echternacht, 2000; DeAngelis, 2003; Garavilia & Gredler, 2002; Ishitani, 2003; Naumann, 2003). In addition to being a significant predictor in the study’s model of online course learning achievement, this variable also correlated moderately with the dependent variable (r=.40, p<.0001). This is reasonable as one would expect previous academic achievement to predict future learning. Additional associations between this variable and the other independent variables will be discussed later.

Self-efficacy for computer use (Comp_SE). Students reported their ability to use computer technology by responding to two Likert-scaled questions. The responses for each question were added together and the sum represented the student's overall self-report score for computer self-efficacy (M=6.38, S.D.=1.18). This variable was not a predictor in the final model of learning achievement in this study (b= -0.11, β=-.01, t=-.16, p=.87). Self-efficacy for computer technology use was found not to be related to learning achievement as measured by final course grade in an undergraduate asynchronous online course. In fact, the correlation between computer self-efficacy and final grade was not significant (r = -.09).

Prior studies found that the degree of computer self-efficacy or self-efficacy for using Internet tools did not correlate with course learning in courses where Internet use and computer technology was used in addition to traditional teaching methods (Kern, 1995; Lan, 1998). However, in the present study, self-efficacy for computer use was found not to be related to learning achievement even though only Internet-based teaching methods were used. This may be because learners did not consider the use of computer-based technology such as the Internet, e-mail, and course management tools to be any more challenging than the activities used in traditional class environments. For example, in the present study, students earned relatively high scores across the board in their scale of Compse ($\bar{x}$=6.38 out of a maximum of 8, SD 1.18), indicating that they may not have considered the use of computer or Internet technologies for learning as any more challenging than learning in a traditional classroom-based course.

On the other hand, other research concerning factors that affect learning in Web-based environments has identified self-efficacy for computer use as a correlate of learning achievement (Agarwal, Sambamurthy & Stair, 2000; Joo Bong & Choi, 2000; Wang & Newlin, 2002). For example, Wang and Newlin's quantitative study of college undergraduates enrolled in an online research methods psychology course found that student self–efficacy beliefs regarding their use of computer technology correlated with their learning achievement as measured by final course grade. While it is reasonable to conclude that learning achievement in online learning is influenced by one's self-efficacy for computer and Internet technology, this relationship may have been absent in this research study because the sample of college undergraduates differed from the samples in the studies cited above in a very important way. Most of the participants in the present study were traditional undergraduates (mean age was 22.4) who, unlike the undergraduate cohorts studied in earlier research, grew up with computers and Internet tools since an early age. There was very little variation in computer technology self-efficacy scores for this cohort. This suggests that most students rated high on their comp_SE rating. This is not surprising as they are representative of a generation of students who have grown up using computer and Internet technology. Self-efficacy is a function of one's experience. Therefore the more experience one has with computer use, the more self efficacious she should feel regarding computer technology. Moreover, computer use and Internet use such as e-mail use has exploded within the past five years such that the current undergraduates have arrived at college computer literate and fluent in the use of Internet tools. Therefore, it is likely that there was much less variation among the present cohort of undergraduates compared to those in earlier studies (Agarwal, Sambamurthy & Stair, 2000; Joo Bong & Choi, 2000; Wang & Newlin, 2002) because the current students were learning to use computers and the Internet in middle school and high school while the study cohorts in previous research studies were probably first learning to use the technology while in college.

Reason for taking an online course (reason_ol). In this study, reason for taking the course online fell into three categories: (a) convenience, (b) no option, and (c) interest in learning online. After dummy coding and placement in the regression model, this categorical variable turned out not to be a predictor in the model of learning online ($b= -2.24$, $\beta=-.08$, $t=-1.46$, $p=.14$); nor was it associated with learning achievement ($F=1.22$ $p >F =.30$). This finding contradicts previous research findings of a direct relationship between reason for taking an online course and learning achievement. For example, in earlier studies, students who chose to learn online either because they enjoyed it or were actively curious to learn more about it tended to earn higher course grades than other students who gave reasons related to convenience or who stated that they had no other option to study (Roblyer, 1999; Wang & Newlin, 2000, 2002b).

The lack of a statistically significant association between reason for taking an online course and final course grade in the current research study may have occurred because of a general lack of variation in the final grades earned by the individuals in this study. For example, as noted earlier, the sample of 201 students had a mean final grade of 86.63 and SD =13.31. It is important to consider that almost 57% of the students in this sample earned a numerical final course grade that was equal to or greater than 90. If there had been a greater number of students in the study sample as well as a wider variability in final course grade scores, then perhaps reason for taking a course online might have been a predictor of learning achievement among undergraduates taking asynchronous online courses.

Interaction term (GPA_Exp). The interaction term (GPA_Exp) was a cross product of GPA and expectancy (ExpSE_sum) and was created in order to better understand how each factor's association with learning achievement may be affected by the presence of the other. It was a significant predictor in the model of learning achievement ($b= -1.56$, $\beta=-2.41$, $t=-4.28$, $p<.0001$) in asynchronous undergraduate online courses. Furthermore it had the largest correlation with final grade compared to the other variables ($r = .52$). This is reasonable given that the new term consisted of the cross product of two independent variables (GPA, Exp) which individually also had the greatest correlations with the dependent variable. The literature describes the relationship between prior academic achievement and expectancy as synergistic; each variable has a positive effect on the other such that the combined effect of the variables on a third variable (in this case "FinGr," the study's dependent variable) is greater than the effect that either variable exerts alone (Boekarts, Pintrich & Zeidner, 2000). This effect was demonstrated not only by the correlation coefficients (GPA with Fin Gr $r = .40$), Expectancy with FinGr $r = .39$, GPA_Exp with Fin GR $r =.52$) but also by the linear model that predicted final course grade. Noteworthy associations between this variable and other independent variables will be discussed in the section on intercorrelations of the independent variables.

Intercorrelations of Independent Variables

A correlation matrix of the study's variables (Table 11) demonstrated that in addition to the significant associations previously noted between the predictive models's independent variables with the study's dependent variable, there were also significant associations of some of the SRL and EB independent variables with each other as well as with prior academic achievement. This section will consider those relationships.

SRL subfactors and EB subfactors. In the current study, the following SRL and epistemological belief factors were intercorrelated as follows: expectancy with quick learning (r = -.34); resource management with quick learning (r = -.43), with simple knowledge (r = -.25) and with innate ability (r =.22); intrinsic goal orientation was weakly to moderately correlated with quick learning (r = -.20), simple knowledge (r = -.14), and weakly to moderately with innate ability (r = -.19).

The findings listed above indicate that students who believed that learning should be quick and painless were less likely to have demonstrated expectancy for learning. This is reasonable because expectancy for learning requires experience in overcoming obstacles through perseverant effort (Bandura, 1997). If a student conceives of learning as quick or only as an exercise in memorizing rote facts, “simple knowledge,” he is less likely to put forth time and effort towards his learning. As a result, he will not gather the experience he needs in order to develop the sense of control over his learning that marks expectancy for learning. Such students will be less likely to take ownership of their learning and, according to Bandura, be less convinced that they have what it takes to succeed, persevere, and regulate their effort to learn even in the face of adversity (Bandura, 1997). Similarly, expectancy and innate ability are negatively correlated. This is because if one believes that learning is innate then there is no need to apply effort to one’s learning. On the other hand, expectancy for learning is built on previous positive efforts made in behalf of one’s learning.

Furthermore, the above correlation between IGO and QL indicates that individuals who are intrinsically goal oriented probably do not tend to believe that learning is primarily a quick process consisting of rote memorization. This coincides well with previous research that suggests that being intrinsically goal oriented is associated with positive learning outcomes, especially when the learning is deep or conceptual rather than surface or rote memorization (Ryan & Deci, 2000).

These correlations suggest that there are associations between some self-regulated learning and epistemological beliefs subfactors. In fact, there is only one previously published study that had demonstrated similar relationships between SRL motivational factors and epistemological belief factors (Paulsen & Feldman, 1999). Paulsen & Feldman's study showed that there were multiple (≥2) intercorrelations between self-regulated learning and epistemological beliefs subfactors.

The SRL subfactors that were represented in the final study model fell on to two motivational scales (intrinsic goal orientation and expectancy) and one learning strategy scale (resource management). These scales describe a student's desire to interact with instructional material and his inclination to use certain strategies to complete assigned tasks. On the other hand, the epistemological belief subfactors fell on scales that describe how learners conceptualize knowledge and learning and provided a way to measure individuals' intellectual development. Some have likened epistemological beliefs to filters that color and guide students' actions in various learning contexts. (Alexander, Murphy, Guan, & Murphy, 1998; Hofer & Pintrich, 1997).

Flavell (1979) and Hofer (2001) had both argued previously that self-regulated learning and epistemological beliefs are positively correlated. Paulsen and Feldman's (1999) study demonstrating intercorrelations among self-regulated learning and epistemological beliefs subfactors lends support to their theoretical contention. Furthermore, the results in the present study also lends credence to their argument that a student's motivation for academic learning and his intellectual development may very well be related.

Intercorrelation: SRL and EB Subfactors with Prior College Academic Achievement

In the current study, prior college academic achievement was measured by using student's current GPA. Expectancy had the highest correlation with GPA (r = .30), followed by effort regulation (r = .25) and quick learning (r = -.23). These findings parallel those for the correlations between these same subfactors and final course grade, the study's dependent variable. This is not surprising given that GPA and FinGr are measures of learning achievement and that they were correlated with each other (r = .40) Therefore, expectancy, effort regulation and quick learning were associated with final course grade as well as with the overall measure of college academic success.

Study's Predictive Model and Past Research

The predictor variables in the present study accounted for 35% of the variance in learning achievement. Unlike other methods of analyzing achievement variance, multiple regression identifies the contribution of a variable to the variance of the dependent outcome variable beyond that accounted for by the other variables. As indicated in Table 13 only Expectancy, GPA, and GPA_Exp were statistically significant ($p<.001$) in predicting final course grade.

Therefore, in this study, the best predictors of learning achievement in undergraduate asynchronous online courses were prior college academic achievement (GPA), expectancy for learning (ExpSE_sum), and the interaction term based on the cross product of prior academic achievement and expectancy (GPA_Exp). In addition to being the most important independent variables in the model, these three variables also correlated most strongly with the dependent variable compared to other independent variables in the model (see Figure 3).

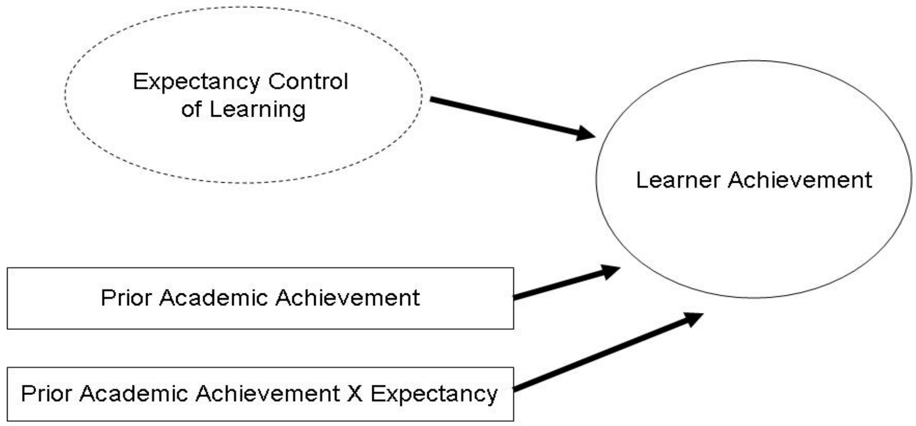


Figure 3. Factors that predict learner achievement in an asynchronous Web-based course.

There have been few previous research studies that have employed multiple regression in order to investigate the relationship between either self-regulated learning or epistemological beliefs and learning achievement (Bendixen and Hartley, 2003; Chen, 2002; Garavilia & Gredler, 2002; Peng, 2003). The percentage of variation in learning explained by each of these study's predictive models varied from as low as 7% (Chen, 2002) to as high as 42% (Bendixen and Hartley, 2003; Garavilia & Gredler, 2002). While the current study was closer to the high end of this group of studies in the amount of variation in learning that it explained, it is important to note that the previous studies examined either self-regulated learning or epistemological belief subfactors but not both together in the same study.

As with the present study, previous empirical research studies that looked at self-regulated learning subfactors have yielded one or two significant predictors in their models of learning achievement. However, the specific subfactors that were identified as significant predictors of learning varied among the studies. For example, a study of undergraduate IS students in a lecture and computer-based lab course demonstrated that effort regulation was the sole SRL factor to predict final course grade in the lecture portion of the class and that time and place management was the other predictor for the computer-based lab portion of the class (Chen. 2002). On the other hand, Garavila and Gredler's (2002) study with undergraduate psychology students found that an SRL factor called planning and organization, prior grades and SAT predicted final course grades.

There are reasons for these differences among the studies. For example, the nature of the academic task that students had to perform (completing a computer lab exercise versus accurately taking lecture notes) might have required different self-regulated strategies in order to be successful. While Chen used the MSLQ, she did not elect to include expectancy in her model of learning. Furthermore, she did not include prior academic achievement in her model. Therefore, it is not known if her results would have been different if expectancy had been part of her predictive model.

Garavilia and Gredler (2002) used a different questionnaire than the one used in the current study. It was based on a different research framework that contained different categories of SRL behaviors. As a result, the final predictors could not be expected to match.

Despite these differences, the current study and the studies of Chen (2002) and Garavilia and Gredler (2002) were all similar in identifying a single SRL subfactor as a predictor of undergraduate learning. Furthermore, the current study confirmed Garavilia and Gredler's finding that measures of prior academic achievement are also predictors along with a SRL subfactor in a model of learning achievement. It is important to note that the current study differed from these previous studies because it included only students from asynchronous online undergraduate courses and, unlike the previous studies, also included an interaction term which consisted of prior academic achievement (GPA) and the self-regulated learning subfactor, expectancy.

Although past studies (Bendixen & Hartley, 2002; Peng, 2003; Schommer, 1990) have found that quick learning, simple knowledge, and innate ability were correlated with learning achievement, only quick learning was found to be associated with learning achievement in the current study. Furthermore, unlike previous studies where quick learning was found to be a predictor in the multiple regression model of learning achievement (Bendixen & Hartley, 2002; Peng, 2003), it was not a predictor of learning achievement in the current study. Again, those previous studies did not look at SRL and EB in the same model. It is not known, then, whether similar results for the EB factors would have been obtained if the current study had only looked at EB factors.

While a comparison of this study's predictive model with previous research studies indicated differences in the predictor variables that emerged to explain variance in learning achievement, the next section will explore the question as to why out of all the self-regulated learning and epistemological belief subfactors only one (expectancy) was a predictor in the model that explained learning achievement in undergraduate asynchronous online courses.

Why Did the Linear Model Include Only One of the Originally Proposed Predictors?

The study's results yielded a parsimonous solution to the original study research question and indicated that although there were multiple factors that were bivariately correlated with learning, only one of the original self-regulated learning subfactors and none of the epistemological beliefs subfactors were a predictor of learning achievement in asynchronous Web-based online undergraduate courses. For example, although quick learning was weakly correlated with the dependent variable, FinGR (-.16), it was more highly correlated with expectancy ($r = -.34$). Likewise, even though effort regulation was fairly correlated with FinGr ($r = .32$), it was more highly correlated with the other self-regulated learning subfactor, expectancy ($r = .50$). Therefore, it appears that quick learning and effort regulation probably shared variance in common with expectancy and, as a result, were weaker predictors of final grade than was the expectancy for control of learning subfactor. As a result, expectancy acted as an umbrella term that represented the other correlates of the dependent variable (FinGR) in the predictive model of learning achievement in asynchronous online undergraduate courses.

Self-regulated learning is an important linchpin in social cognitive learning theory, and much of one's success in self-regulation hinges on having a positive attitude and motivation towards learning. For this reason, the self-regulated subfactors that were the focus of this study represented motivational and attitudinal aspects of learning because they set the conditions for the adoption of other self-regulated learning strategies. For example, expectancy for learning or having an expectation that one will experience positive outcomes in one's learning is a central driving force for self-regulation (Boekarts, Pintrich & Zeidner, 2000; VanZile-Tamsen, 2001,). Moreover, other researchers have underscored the role played by individual self-efficacy in facilitating expectancy for learning (Bandura, 1997; Williams & Hellman, 2004). Therefore, an individual with strong expectancy for learning also possesses the "can do" attitude required to succeed in learning. Such attitudes are the product of positive reinforcement and explain the mutually positive or synergistic relationship between not only prior academic achievement and expectancy, but also between expectancy and other motivational behaviors associated with self-regulated learning. This may explain why, in this study, the self-regulated learning subfactors were correlated with each other. However, it would appear that because expectancy was the only self-regulated learning subfactor to make it to the predictive model, it acted as a global factor that served as a proxy representing the other self-regulated subfactors in the predictive model. This observation is reasonable because strong expectancy for learning depends on having other positive attitudes and behaviors consistent with success in learning. It is as though expectancy for learning serves to grease the wheels of self-regulated learning. Like the little engine that could, once an individual expects positive outcomes for his learning and takes responsibilty for his learning, he will do what it takes (i.e, regulate his effort accordingly and/or select appropriate time and study management strategies) in order to be a successful learner.

The epistemological belief subfactor, quick learning, was moderately correlated with effort regulation and expectancy for learning; yet it, too, failed to become a significant predictor in the linear model. This failure may have been for the same reason discussed above, that is, expectancy served as its proxy; if a student has positive expectancy for learning, she will tend to conceive of learning as a process that requires work and effort. A belief that learning is quick and requires little effort would not be expected to coincide with a positive expectancy for learning.

Thus, it is unlikely that a multiple regression equation that already contained expectancy would need other variables like quick learning and effort regulation in order to improve the accuracy of its predictive power; any variance in final grade due to effort regulation and quick learning had probably already been accounted for by expectancy. As a result, the effort regulation and quick learning variables were redundant and consequently displayed non-significant beta weights. Despite the credible nature of this explanation, the next section considers other plausible explanations for the results obtained by this study.

Limitations of the Findings

In addition to how variables may have intercorrelated in this study, other factors may have conspired to influence the shape of the final predictive model. For example, the low number of original predictors that made it in the final linear model may have been because of the relatively low sample size for the number of predictors in the model. This study sample size may not have been robust enough for the number of variables studied. The original model consisted of 14 independent variables and, after factor analysis, was reduced to 10 variables. The study sample consisted of 201 students, which was deemed minimally sufficient based on a recommendation of 15-30 subjects per predictor variable (Hatcher & Stepanski, 1994). Based on the upper limit of Hatcher and Stepanski's guideline, however, a larger sample size would probably have been more appropriate in order to successfully detect differences among the respondents such that more predictors might have emerged in the final model of online learning achievement. Therefore, in the future, this study should be repeated with an optimum sample size of about 500 participants in order to meet the high end of Hacker and Stepanski's recommendation of 30 respondents per variable.

Furthermore, Dillman (2001) cautioned that measurement error can be caused by inaccurate responses. Such responses may be a function of survey takers behavior or some aspect of the survey instrument itself. The questionnaire used in this study was entirely Web-based, and students completed and submitted it without any guidance or potential intervention from a proctor. This aspect of the data collection contrasts sharply with the previous research studies (Bendixen & Hartley, 2003; Pintrich et al., 1991). In those studies, students completed paper-and-pencil questionnaires in a classroom environment in the presence of a proctor. In the present study, students accessed, completed, and submitted responses to the survey instrument via the Web without the presence or participation of a proctor. Therefore, it is not known to what extent inaccurate responses caused by survey mode effects or some aspect of the respondent's behavior might have contributed to measurement error and affected the results obtained. For example, such behavior might have been a cause for the factor structure patterns obtained for the survey question items.

Recommendations for Future Research

Other Factors That May Influence Learning Online

The study's final predictive model explained about 35% of variance in the dependent variable (learning achievement as measured by final grade). On the other hand, this explanation implies that 65% of the variance in learning achievement remained unexplained by the model. This study focused on the effect that learner characteristics had on student final course grades; it did not consider the role that other factors external to the learner might have had on influencing student final course grade. Therefore, future research needs to be done in order to learn about other factors that may influence learning achievement in online undergraduate courses.

One such factor is the instructor. For example, in the present study students from a variety of undergraduate courses and disciplines were sampled. These courses were, in turn, taught by different faculty members. This was true not only for courses from different disciplines but also for different course sections belonging to the same academic subject area. Briefly, there were approximately 58 different course instructors who taught the same number of course sections taken by the students who participated in this study. However, it is not known to what extent instructor associated factors such as teaching style or instructional design may have played a role in affecting the final course grade earned by a specific student. It is recognized that an individual learner's disposition to self-regulate learning and to adopt certain attitudes about learning and knowledge are influenced by his interaction with teachers and instructors (Giancarlo, Blohm, & Urdan, 2004; Hofer, Yu, & Pintrich, 1998; Zimmerman, 2000). Therefore, it is reasonable to recommend that any future studies of learner achievement in asynchronous online courses investigate how the learning environment (instructor and/or instructional design of the course) impacts learner achievement.

Different Measures of Prior Academic Achievement or Learning Aptitude

Despite the entrance of new multimedia technologies for the delivery of Web-based course content, the majority of asynchronous online courses in higher education still rely on text-based knowledge as their predominant format of learning. This means that students need to be fluent readers in order to learn in online courses because online learning courses are, for the most part, text-based (National Center for Educational Statistics, 2003; Wolfe, 2000).

In the current study, GPA was used as a gauge of prior academic achievement. However, the mean GPA for the study sample was 3.0 and over half the participants in this study had GPA ≥ 3). If most students earn a high GPA, then it is possible that GPA is not a sensitive enough measure of academic learning. On the other hand, a study of undergraduate psychology and business majors (Royer & Abranovic, 1987) found that reading comprehension of reading material drawn from a college course predicted performance and learning in the course better than overall GPA. Furthermore, in a study with undergraduate pre-service teachers, Bendixen and Hartley (2003) included reading comprehension in their model of learning achievement. They did so because their post-test design included a reading comprehension assessment. Most asynchronous online courses are text-based, and students have to read a variety of information online (e.g., advanced organizers, schedules, discussion boards, exam question items as well as knowledge content) in order to learn. If individuals with higher reading comprehension scores are more successful learners than others with lower reading comprehension scores, then reading comprehension scores may be more accurate predictors of learning in an undergraduate college course than GPA. Therefore, future studies of learning achievement in asynchronous online undergraduate courses should include reading comprehension in the predictive model. It would be interesting to know whether the inclusion of this factor helps explain more variation in learning achievement than its absence from the model.

Revisiting the Role Played by Self-Efficacy for Computer Technology Use

Contrary to previous research findings that associated computer self-efficacy and learning achievement in online courses (Agarwal, Sambamurthy, & Stair, 2000; Joo, Bong, & Choi, 2000; Wang & Newlin, 2002a;), in this study Comp_SE played no significant role in online learning achievement. Comp_SE also did not vary because the tools that students were required to use in their learning were common staples of personal computing such as e-mail and the Internet. It is likely that most users, regardless of the generational cohort to which they belonged, knew how to use these tools in their online learning. However, instructional designers are beginning to incorporate more sophisticated tools such as Web page building and Macromedia Flash multimedia packages into their courses, and it would be useful to know how student literacy with such tools can affect learning in online environments.

Therefore, it is recommended that this study be repeated and include intentional sampling based on the sophistication of the instructional technology used and on individual computer self-efficacy for the use of sophisticated technology in order to determine whether such computer self-efficacy plays a role in learning online. For example, a study that includes online courses that require more sophisticated skills in computer technology (e.g., Macromedia Flash tools and posting to a Web server) as well as a study sample with more variability in its ability to use such technologies might then be more likely to reveal any potential relationship between computer self-efficacy and online learning. .

Use of Different Research Methodologies

The current study used quantitative methods to investigate the relationship between certain subfactors of SRL and epistemological beliefs with learning achievement in online course environments. However, there are researchers who are calling for the use of multiple methods in the investigation of the role of self-regulated learning and epistemological beliefs in explaining learning achievement in online courses. This call for mixed methods research is because both constructs, SRL and EB, are recognized as complex entities and, as such, may require a range of methodologies in order to better understand their influence on learning (Patrick & Middleton, 2002; Perry, 2001). For example, some researchers recommend the use of qualitative methods that include observing and interviewing subjects in order to gather rich descriptions of what, when, how, and why students use self-regulated learning strategies as well as to determine when they may adopt sophisticated beliefs about knowledge (Zeidner Boekarts, & Pintrich, 2000). In addition, triangulation with qualitative and quantitative methods can help confirm a theory to a greater degree than can either method used in isolation (Risjord, Dunbar, & Moloney, 2002). Thus, findings from both quantitative research methodologies based on survey data collection and qualitative research strategies based on interviewing and observation can help to either confirm or contradict hypotheses regarding the connection between self-regulated learning and/or epistemological belief subfactors and learning achievement. A future replication of this study should include qualitative as well as quantitative techniques of data collection and analysis.

The correlations among the self-regulated learning and epistemological beliefs subfactors suggest that there might be a specific sequential relationship among the independent variables that would explain why only certain factors ended up in the predictive model while others did not. This relationship between the variables might be better understood by using path analysis to analyze the data and determine whether they fit a causal model. It is recommended that a future replication of this study include the use of path analysis in order to determine more clearly what the relationships among the variables may be.

Recommendations for Researchers and Practitioners

There are several findings from this study that are relevant and useful for researchers who conduct research about online learning and for educational practitioners who teach via asynchronous Web-based learning environments.

For Researchers

The vast majority of the previous 10 years of quantitative research studies involving SRL has assumed the validity and reliability of the factor scales obtained by the developers of the MSLQ. This study demonstrated that this assumption may not be a prudent research strategy because exploratory factor analysis conducted as part of the present study yielded a different factor structure for the instrument's question items. If the original confirmatory factor analysis results for the MSLQ instrument had been conclusive, then the current study's exploratory factor analysis should have validated the original factor scales. This did not occur and calls into question the accuracy of the original factor structure for the MSLQ. On the other hand, the factor structures obtained in the current study for the epistemological beliefs question items were a closer approximation of the original scales proposed by the developers of the EBI for the epistemological question items.

The altered factor structures for both the SRL and EB survey items resulted in improved reliabilty for 4/7 of the original factor scales. In addition, this new factor structure suggests that expectancy for learning acted as an umbrella term for the other SRL and EB factors and represented them in a proxy-like fashion in the study's predictive model of learning achievement in asynchronous undergraduate courses. Based on the factor structure results obtained for the two sets of question items, it is advised that researchers avoid relying on previously obtained factor structures for their study samples but rather perform their own factor analyses of item responses. In this way, they can be confident about the validity and reliability of the question items used in their study.

For Researchers and Practitioners

The current study looked at undergraduate courses that were delivered completely online. Overall, the students in these courses earned high final grades (M = 86.36 SD = 13.31) with 55.7 % earning 90 or above. The pattern of high final grades earned by the students in this study may have been attributed to the type of learning assessments used to evaluate student learning in the asynchronous online courses. An informal survey of the instructors who taught the courses revealed that the overwhelming majority (56/60 or 93%) relied on short answer or multiple-choice examinations as their primary mode of assessing student learning. This is because this exam format is best supported in the asynchronous course management systems used by most universities, including the one in the current study. The drawback of relying exclusively on such testing, according to critics, is that multiple-choice testing may be sufficient for testing surface knowledge such as facts but not as appropriate for assessing critical thinking and communicative competence, elements often associated with deep or critical learning (Paxton, 2000; Weigel, 2002). This is noteworthy because much of the self-regulated and epistemological beliefs research agrees that the inclination to self regulate one's learning coincides with the type of learning one is required to do. That is, deep or critical learning is associated more closely with the self-regulation of learning and with holding sophisticated ideas about learning and knowledge than is surface or rote memorization (Paris & Winograd, 2001).

Therefore, in order to ensure that students are more inclined to use self-regulation in their learning, instructors should build in evaluation techniques that require critical or deep learning skills. For example, instructors may want to consider adding other types of learning assessments, such as writing assignments, into their asynchronous online courses in order to augment short answer exams.

This study contributed to the educational research literature not only by what it revealed regarding the relationship between certain self-regulated learning and epistemological beliefs subfactors with learning achievement in undergraduate AWBL online courses but also by what it demonstrated about the relationship between prior academic achievement and the self-regulated learning subfactor called expectancy for learning. While the previous research literature argued that both entities are correlated and as such mutually influence learning achievement, the current study has shown that their association may be more complex than a simple one to one relationship. Specifically, it turns out that the association of each factor with learning achievement is modified by the presence of the other. For example, in the current study, expectancy for learning exerted a greater effect at lower values of GPA than it did at higher values of GPA (see Figure 2). Furthermore, GPA's impact on final course grade was mitigated at higher levels of expectancy for learning. Future studies should be done to confirm this relationship among prior academic achievement, expectancy for learning, and learning achievement. However, if this finding holds, it suggests that in certain cases expectancy for learning might be even more important than prior academic achievement in predicting learning achievement in asynchronous online learning environments.

Some argue that because AWBL environments are learner-controlled rather than teacher-controlled environments, attrition rates from online versus classroom-based courses are higher (Carr, 2000; Diaz, 2002; Parker, 1999). The next section discusses recommendations for educational administrators and policy makers concerning how this study's findings can be used in order to help minimize attrition from online undergraduate courses.

For Educational Administrators and Policy Makers

State governments are suffering under the weight of ballooning budget deficits and must curtail spending on higher education even though most public universities are experiencing burgeoning growth in undergraduate enrollment. As a result, many public institutions are encouraging the adoption of Web-based course and degree programs in order to accommodate their expanding student base without making substantial capital expenditures on building construction (Jones, 2003). However, the dropout rate among asynchronous online learners is higher than that for traditional classroom learners (Carr, 2000; Diaz, 2002; Parker, 1999; Phipps & Merisotis, 1999). Dropping out is the ultimate expression of low expectancy for learning. Attrition may occur as a result of students discovering that online learning is different from conventional classroom-based learning. Those who drop out from online courses may just not be ready to assume roles as self-directed and self-monitoring learners. The least successful asynchronous online learners in the current study were those who had the lowest self-expectancy for learning online and the weakest prior college academic achievement. On the other hand, those students who had very high expectancy for learning succeeded in online courses regardless of their prior academic achievement. As a result of this information, it may not be prudent to engage in a one-size-fits-all substitution of asynchronous online courses for classroom-based courses without first understanding who would be most likely to succeed in online learner-controlled environments. Thus, it is recommended that a student profile that includes prior academic achievement (GPA) and expectancy for learning be used when advising students on their decision to take online course sections.

Conclusions

The current study contributed to the research genres of online learning and educational psychology because it helped to specify the role played by certain self-regulated learning and epistemological beliefs in learning achievement. In this study, students who scored higher than other students on the expectancy factor were more likely to achieve higher final course grades than those who scored lower on this factor. This may have occurred because, in addition to being more self-efficacious about their learning, they also held themselves more responsible for their own learning outcomes than did other students. In addition, these students were also more inclined to use effective self-regulated learning strategies as well as hold more positive beliefs about learning and knowledge than their counterparts who scored lower on the expectancy factor scale.

Based on these findings, the most important predictors of learning achievement in asynchronous online undergraduate learning environments were expectancy for learning, GPA, and a cross product term composed of both expectancy for learning and GPA. Bandura's (1986) social cognitive theory emphasized the role that expectancy for learning plays in learning achievement. This present study appears to have confirmed Bandura's theory about the relationship between expectancy and academic achievement. Given that expectancy for learning was intercorrelated with several other self-regulated learning subfactors as well as epistemological belief subfactors in this study, it is reasonable to conclude that if a learner believes himself capable of successfully learning on the Internet and holds himself responsible for his learning achievement (expectancy), then he will be inclined to use positive learning strategies and adopt practices that will endable him to attain his goal of academic (learning) achievement. For example, such practices may include effort regulation to overcome distractions and appropriate time and place resource management in order to study effectively. Finally, such individuals who put forth the effort to learn are also likely to believe that learning is a complex process that requires time and practice in order to succeed.

Findings from this study also suggest that individuals with the greatest expectancy for learning, regardless of their prior academic achievement, were the most successful asynchronous online learners. Expectancy for learning appears to be a learner characteristic that is molded and shaped by previous academic learning experiences (Bandura, 1997;

Boekarts, Pintrich, and Zeidener, 2000; Hofer, Yu, & Pintrich, 1998) and, as such, it behooves responsible educators to ensure that students enter college armed with strong expectancy for controlling their learning. After all, college has traditionally been a stage of education where individuals must assume greater responsibility for their learning compared to the primary and secondary schooling experiences (Perry 2001; Thompson & Geren, 2002). Moreover, today's college student is faced with an even greater need to be able to assume responsibility for his learning because more undergraduate courses and programs are being delivered via asynchronous online environments. Student success in these new learning environments requires not only the ability to self-regulate one's learning but also sophisticated notions about knowledge and learning.

Thus, it is incumbent on us as educators to ensure that students who come to college are prepared to take responsibility for their learning. This can be done by building in more asynchronous online course work earlier during the formative schooling years and through the secondary level. If this is done, then more students will develop positive attitudes that characterize expectancy for controlling the outcomes of their learning. Moreover, the study's findings also suggest that unless and until an undergraduate is ready to take asynchronous online courses, he should be advised to remain in conventional face-to-face courses.

Finally, in addition to the preparation of future college students, the findings from this study can help prepare future professional practitioners and lifelong learners. Eighty-six per cent of students in the current study sample were enrolled in pre-professional majors such as business, education and health. Most of these disciplines require that practicing professionals earn continuing education credits in order to maintain their credentials. An ever increasing number of professional bodies are offering continuing education via online courses.

Universities that provide a high quality online learning experience can benefit students in professional programs by helping them become discerning and discriminating consumers of continuing education courses as well as effective future lifelong learners.

REFERENCES

Agarwal, R., Sambamurthy, V., & Stair, R. (2000). Research report: The evolving relationship between general and specific computer self-efficacy: An empirical assessment. *Information Systems Research, 11*(4), 418-430.

Alexander P. A., Murphy P. K., Guan J., & Murphy P. A. (1998). How students and teachers in Singapore and the United States conceptualize knowledge and beliefs: Positioning learning within epistemological frameworks. *Learning and Instruction*, *8*(2), 97-116.

Anderson, M. (1997). Critical elements of an Internet-based asynchronous distance education course. *Journal of Technology Systems, 26*(4), 383-388.

Anderson, M. (2000). Individual characteristics and Web-based courses. In C. R. Wolfe (Ed.), *Learning and teaching on the World Wide Web* (pp. 47-72). San Diego, CA: Academic Press.

Aviv, R., Erlich, Z., Ravid, G., & Giva, A. (2003). Network analysis of knowledge construction in asynchronous learning networks. *Journal of Asynchronous Learning Networks, 7*(3), 1-23.

Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory.* Englewood Cliffs, NJ: Prentice Hall.

Bandura, A. (1997). *Self-efficacy: The exercise of control.* New York: W. H. Freeman.

Baxter-Magolda, M. B. (1993, April 13). *The convergence of relational and impersonal knowing in young adults' epistemological development.* Paper presented at the Annual Meeting of the American Educational Research Association, Atlanta, GA.

Belenky, M. F., Clinchy, B. M., Goldberger, N. R., & Tarule, J. M. (1986). *Women's ways of knowing: The development of self, voice and mind.* New York: Basic Books.

Bell, P. (2001). Learning medical terminology in a traditional classroom versus the World Wide Web: Is there a difference in PA student performance? *Perspectives on Physician Assistant Education, 12*(4), 232-235.

Bendixen, L., & Hartley, K. (2003). Successful learning with hypermedia: The role of epistemological beliefs and metacognitive awareness. *Journal of Educational Computing Research, 28*(1), 15-30.

Boekarts, M. (1997). Self-regulated learning: A new concept embraced by researchers, policymakers, educators, teachers, and students. *Learning and Instruction, 7*(2), 161-186.

Boekarts, M., Pintrich, P. R., & Zeidner, M. (2000). *Handbook of self-regulation*. San Diego, CA, Academic Press.

Bouffard-Bouchard, T. (1993). Self-regulation on a concept formation. *Journal of Experimental Child Psychology, 56,* 115-134.

Byers, A. (2000). *Interaction: The key to successful distance learning.* Paper presented at Edmedia 2000 World Conference on Educational Multimedia, Hypermedia, and Telecommunications, Montreal, Canada.

Camara W. J., & Echternacht, G. (2000) The SAT I and high school grades: Utility in predicting success in college. *The College Board Notes*. New York: The College Board Office of Research and Development.

Campbell, K. K. (1996). *A study of selected characteristics and learning strategies of students related to persistence in tele-courses.* Unpublished doctoral dissertation, University of the Pacific, Stockton, CA.

Carr, S. (2000). As distance education comes of age, the challenge is keeping the students. Colleges are using online courses to raise enrollments but retaining it is another matter. *The Chronicle of Higher Education, 46*(23), 1-5.

Chan, K. (2003). Students' epistemological beliefs and approaches to learning. *Research in Education, 69*(1), 36-50.

Chen, C. (2002). Self-regulated learning strategies and achievement in an introduction to information systems course. *Information Technology, Learning and Performance Journal, 20*(1), 11-25.

Clark, R. E. (1994). Media will never influence learning. *Educational Technology Research and Development, 42*(2), 21-29.

Cohen, J., & Cohen, P. (1983). *Applied multiple regression for the behavioral sciences.* Hillsdale, NJ; Lawrence Erlbaum.

Collins, J., & Pascarella, E. (2003). Learning on campus and learning at a distance: A randomized instructional experiment. *Research in Higher Education, 44*(3), 315-325.

Corno, L. (1989). Self-regulated learning: A volitional analysis. In D. H. Schunk & B. J. Zimmerman (Eds.), *Self-regulated learning and academic achievement: Theory, research and practice* (pp. 111-141). New York: Springer-Verlag.

DeAngelis, S. (2003). Noncognitive predictors of academic performance: Going beyond the traditional measures. *Journal of Allied Health, 32*(1), 52-57.

Demetriou, A. (2000). Organization and development of self-understanding and self-regulation: Toward a general theory. In M. Boekarts, P. Pintrich, & M. Zeidenr (Eds.), *Handbook of self-regulation* (pp. 209-251). San Diego: Academic Press.

Diaz, D. (2000, March/April). Carving a new path for distance education research. *Technology Source,* Retrieved November 14, 2004, from http://ts.mivu.org/default.asp?show=article&id=648

Diaz, D. (2002, May/June). On-line drop rates revisited. *Technology Source*. Retrieved November 14, 2004, from http://ts.mivu.org/default.asp?show=article&id=981

Dillman, D. A. (2000) *Mail and Internet surveys: The tailored design method* (2nd edition), NY: John Wiley.

Dillon, A., & Gabbard, R. (1998). Hypermedia as an educational technology: A review of the quantitative research literature on learner comprehension, control and style. *Review of Educational Research, 68*(3), 322-349.

Distance Education Clearinghouse. (n.d.). *California distance learning project: What is distance learning?* Retrieved November 14, 2004, from http://www.uwex.edu/disted/definition.html

Duell, O. K., & Schommner-Aikins, M. (2001). Measures of people's beliefs about knowledge and learning. *Educational Psychology Review*, 13, 419-449.

Dweck, C. S., & Leggett, E. L. (1988). A social cognitive approach to motivation and personality. *Psychological Review, 95,* 256-273.

Enzer, M. (2004). *Glossary of Internet terms*. Retrieved November 14, 2004, from http://www.matisse.net/files/glossray.html

Eom, W., & Reiser, R. A. (2000). The effects of self-regulation and instructional control on performance and motivation in computer based instruction. *International Journal of Instructional Media, 27*(3), 247-260.

Ertmer, P. A., & Newby, T. J. (1996). The expert learner: Strategic, self-regulated, and reflective. *Instructional Science, 24,* 1-24.

Eshel, Y., & Kohavi, R. (2003). Perceived classroom control, self-regulated learning strategies, and academic achievement. *Educational Psychology, 23*(3), 249-260.

Flavell, J. H. (1979). Metacogntion and cognitive monitoring. *American Psychologist, 34,* 906-911.

Garavilia, L. S., & Gredler, M. E. (2002). Prior achievement, aptitude and use of learning strategies as predictors of college student achievement. *College Student Journal, 36*(4), 616-625.

Giancarlo, C. A., Blohm, S. W., & Urdan, T. (2004) Assessing secondary students disposition toward critical thinking: Development of the California measure of mental motivation. *Educational and Psychological Measurement, 64*, 347-364.

Glenberg, A. M., & Epstein, W. (1987). Inexpert calibration of comprehension. *Memory and Cognition, 15*, 84-93.

Hadidi, R., & Sung, C. (2000, August). *Pedagogy of on-line instruction: Can it be as good as face to face?* Paper presented at the Americas Conference on Information Systems, Long Beach, CA.

Hall, V. C., Chiarello, K. S., & Edmonson, B. (1996). Deciding where knowledge comes from depends on where you look. *Journal of Educational Psychology, 88,* 305-313.

Hammer, D. (1994). Epistemological belief in introductory physics. *Cognition and Instruction, 1,* 151-183.

Hannafin, M. J., Land, S., Oliver, K. (1997). Grounded practice and the design of constructivist learning environments. *Educational Technology Research and Development, 45*(3), 101-117.

Hardless, C., Lundin, J., & Nulden, U. (2001, January). *Mandatory participation in asynchronous learning networks.* Paper presented at the 34th Hawaii International Conference on System Sciences, Maui, HI.

Hargis, J. (2000). The self-regulated learner advantage: Learning science on the Internet. *Electronic Journal of Science Education, 4*(4), 1-8.

Hartley, K., & Bendixen, L. (2001, December). Educational research in the Internet age: Examining the role of individual characteristics. *Educational Researcher, 30*(9), 22-26.

Hatcher, L., & Stepanski, E. J. (1994*). A step by step approach to using the SAS system for univariate and multivariate statistics.* Cary, N.C.: SAS Institute.

Hew, K., & Cheung, W. (2003). Models to evaluate on-line learning communities of asynchronous discussion forums. *Australian Journal of Educational Technology, 19*(2), 241-259.

Hill, J. R., & Hannafin, M. J. (1997). Cognitive strategies and learning from the World Wide Web. *Educational Technology Research and Development, 45*(4), 37-64.

Hofer, B. K. (2001). Personal epistemology research: Implications for learning and teaching. *Journal of Educational Psychology Review, 13(*4), 353-382.

Hofer, B. K. (2002). Personal epistemology as a psychological and educational construct: An introduction. In B. K. Hofer & P. R. Pintrich (Eds.), *Personal epistemology: The psychology of beliefs about knowledge and knowing* (pp. 3-14). Mahwah, NJ: Lawrence Erlbaum Associates.

Hofer, B. K., & Pintrich, P. R. (1997, Spring). The development of epistemological theories: Beliefs about knowledge and knowing and their relation to learning. *Review of Educational Research, 67*, 88-140.

Hofer, B., Yu, S., & Pintrich, P. (1998). Teaching college students to be self-regulated learners. In D.H. Schunk & B.J. Zimmerman (Eds.), *Self-regulated learning from teaching to self- reflective practice.* New York: The Guilford Press.

Holloway, R. E., & Ohler, J. (1991). Distance education in the next decade. In G. J. Anglin (Ed.), *Instructional technology: Past, present, and future* (pp. 259-66). Englewood, CO: Libraries Unlimited.

Isaacson, R., & Fujita, F. (2001, April). *The effects of goals, expectations, and self-efficacy on self-regulation and performance in college students.* Paper presented at the meeting of the American Educational Research Association, Seattle, WA.

Ishitani, T. (2003). A longitudinal approach to assessing attrition behavior among first-generation students: Time varying effects of pre-college characteristics. *Research in Higher Education, 44*(4), 433-449.

Jaccard, J., & Turrisi, R. (2003). *Interaction effects in multiple regression* (2nd ed.). Thousand Oaks, CA.: Sage.

Jacobson, M. J., & Spiro, R. J. (1995). Hypertext learning environments, cognitive flexibility, and the transfer of complex knowledge: An empirical investigation. *Journal of Educational Multimedia and Hypermedia, 12*(5), 301-333.

Jehng, J. J., Johnson, S. D., & Anderson, R. C. (1993). Schooling and students' epistemological beliefs about learning. *Contemporary Educational Psychology, 18*(3), 23-35.

Jones, R. (2003). A recommendation for managing the predicted growth in college enrollment at a time of adverse economic condition. *On-line Journal of Distance Learning Administration, 6*(1), 1-12.

Joo, Y., Bong, M., & Choi, H. (2000). Self-efficacy for self-regulated learning, academic self-efficacy, and Internet self-efficacy in Web-based instruction. *Educational Technology, Research and Development, 48*(2), 5-17.

Kardash, C. M., & Scholes, R. J. (1996). Effects of preexisting beliefs, epistemological beliefs. and need for cognition on interpretation of controversial issues. *Journal of Educational Psychology, 88*(2), 260-271.

Kember, D. (2001). Beliefs about knowledge and the process of teaching and learning as a factor in adjusting to study in higher education. *Studies in Higher Education, 26*(2), 205-221.

Kern, R. G. (1995). Restructuring classroom interaction with network computers: Effects on quantity and characteristics of language production. *The Modern Language Journal*, 79, 457-476.

Kitchener, K. S., & King, P. M. (1981). Reflective judgment: Concepts of justification and their relationship to age and education. *Journal of Applied Developmental Psychology*, *2,* 89-116.

Kuh, G. D., Kinzie, J., Schuh, J. H., Whitt, E. J., & Associates (2005). *Student success in college: Creating conditions that matter.* San Francisco: Jossey-Bass.

Kuhl, J. (2000). A functional-design approach to motivation and self-regulation: The dynamics of personality systems and interactions. In M. Boekarts, P. Pintrich, & M. Zeidner (Eds.), *Handbook of self-regulation* (pp. 111-169). San Diego: Academic Press.

Lan, W. Y. (1996). The effects of self-monitoring on students' course learning strategies: Attitude, self-judgment ability, and knowledge representation. *The Journal of Experimental Education, 64*(2), 101-115.

Lan, W. Y. (1998). Teaching self-monitoring skills in statistics. In D. H. Schunk, & B. J. Zimmermann (Eds.), *Self-regulated learning: From teaching to self-reflective practice* (pp. 86-105). New York: Guilford Press.

Land, S. M., & Greene, B. A. (2000). Project based learning with the Word Wide Web: A qualitative study of resource integration. *Educational Technology, Research and Development, 48*(1), 45-68.

Lee, I. (2002). Gender differences in self-regulated on-line learning strategies within Korea's university context. *Educational Technology, Research and Development, 50*(1), 101-111.

Lim, C. K. (2001). Computer self-efficacy, academic self-concept, and other predictors of a satisfaction and future participation of adult distance learners. *The American Journal of Distance Education, 15*(2), 41-51.

Lockee, B., Moore, M., & Burton, J. (2001). Old concerns with new distance education research. *Educause Quarterly, 2,* 60-62.

McFarland, T. W. (1998). *A comparison of final grades awarded in campus-based courses and courses offered through distance education for winter term 1997*. Fort Lauderdale, FL: Nova Southeastern University. (ERIC Document Reproduction Service No. ED429480)

McKenzie, K., Gow, K., & Schweitzer, R. (2004) Exploring first year academic achievement through structural equation modeling. *Higher Education Research & Development*, *23*, 95-112.

McManus, T. F. (1995). *Testing learner self-regulation in a Web based learning environment*. Unpublished manuscript, University of Texas at Austin.

McManus, T. F. (2000). Individualizing instruction in a Web based hypermedia learning environment: Non-linearity, advance organizers, and self-regulated learners. *Journal of Interactive Learning Research, 11*(3), 219-251.

Miller, J. W. (2000). Exploring the source of self-regulated learning: The influence of internal and external comparisons. *Journal of Instructional Psychology, 27*(1), 47-52.

Nanjappa, A., & Grant, M. M. (2003, Spring). Constructing on constructivism: The role of technology. *Electronic Journal for the Integration of Technology in Education,* 38-56.

National Center for Educational Statistics. (2003). *Post secondary education in the United Sates: Executive Summary*. Retrieved November 14, 2004, from http://nces.ed.gov/surveys/peqis/publications/2003017/#five

Naumann, W. C., Bandalos, D., & Gutkin, T. B. (2003). Identifying variables that predict college success for first generation college students. *Journal of College Admissions, 181,* 4-9.

Neter, J., Wasserman, W., & Kutner, M. (1990). *Applied linear statistical models: Regression analysis of variance and experimental designs* (3rd ed.). Boston, MA: Irwin.

Nunally and Bernstein (1994) *Psychometric theory* (3rd ed.). New York: McGraw-Hill.

Olgren, C. H. (1998). Improving learning outcomes: The effect of learning strategies and motivation. In C. Gibson (Ed.), *Distance learners in higher education* (pp. 77-95). Madison, WI: Atwood.

Oliver, T. A., & Shapiro, F. (1993). Self-efficacy and computers. *Journal of Computer-Based Instruction, 20,* 81-85.

Ormrod, J. (1999). *Human learning* (3rd ed.). Upper Saddle River, NJ: Prentice Hall.

Pajares, F. (2002). Gender and perceived self-efficacy in self-regulated learning. *Theory into Practice, 41*(2), 116-125.

Palincsar, A., & Brown, D. (1987). Enhancing instructional time through attention to metacognition. *Journal of Learning Disabilities, 20*(2), 66-75.

Paris, S. G., & Winograd, P. (2001) The Role of self-regulated learning in contextual teaching: Principles and practices for teacher preparation. Retrieved from, http://www.ciera.org/library/archive/2001-04/0104parwin.htm

Parker, A. (1999). A study of variables that predict dropout from distance education [Electronic version]. *International Journal of Educational Technology*, *1*(2). Retrieved November 14, 2004, from http://www.edu.uiuc.edu/ijet/v1n2/ parker/index.html

Patrick, H. & Middleton, M. J. (2002) Turning the kaleidoscope: What we see when self regulated learning is viewed with a qualitative lens. *Educational Psychologist*, 37, 27-39.

Paulsen, M. B., & Feldman, K. A. (1999). Epistemologic beliefs and self-regulated learning. *Journal of Staff, Program, and Organization Development, 16*(2), 83-91.

Paxton, M. (2000). A linguistic perspective on multiple choice questioning. *Assessment and Evaluation in Higher Education, 25*(2), 109-119.

Peng, H. (2003). *The effects of epistemological beliefs of teacher education students in a case based hypermedia learning environment.* Unpublished doctoral dissertation. University of Missouri-Columbia, Columbia.

Perry, R. P. (2001). Academic control and action control in the achievement of college students: A longitudinal field study. *Journal of Educational Psychology, 93*(4), 776-789.

Perry, W. G. (1970). *Forms of intellectual and ethical development in the college years: A scheme.* New York: Holt. Reinhart and Winston.

Pett, M. A., Lackey, N. R., Sullivan, J. J. (2003). *Making sense of factor analysis: The use of factor analysis for instrument development in health care research*. Thousand Oaks, CA.: Sage.

Phipps, R., & Merisotis, J. (1999). *What's the difference? A review of contemporary research on the effectiveness of distance learning in higher education.* Retrieved November 14, 2004, from Institute for Higher Education Policy Web site: http://www.ihep.org/Pubs/PDF/Difference.pdf

Pintrich, P. R. (1994). Continuities and discontinuities: Future directions for research in educational psychology. *Educational Psychologist, 29,* 37-148.

Pintrich, P. R. (2000). The role of goal orientation in self-regulated learning. In M. Boekarts, P. R. Pintrich, & M. Zeidner (Eds.), *Handbook of self-regulation* (pp. 452-494). San Diego, CA: Academic Press.

Pintrich, P. R., & De Groot, E. V. (1990). Motivational and self-regulated learning components of classroom academic performance. *Journal of Educational Psychology, 82*(3), 3-40.

Pintrich, P. R, Roeser, R. W., & De Groot, E. A. (1994). Classroom and individual differences in early adolescents' motivation and self-regulated learning. *Journal of Early Adolescence, 14*(2), 139-162.

Pintrich, P. R., & Smith, D. A. (1993) Reliability and predictive validity of the motivated strategies for learning questionnaire (MSLQ). *Educational and Psychological Measurement*, *53*(3), 801-813.

Pintrich, P. R., Smith, D. A., Garcia, T., & McKeachie, W. J. (1991). *A manual for the use of the motivated strategies for learning questionnaire (MSLQ).* Ann Arbor, MI: University of Michigan.

Pressley, M., Borkowski, J., & Schneider, W. (1989). Good information processing: What it is and what education can do to promote it. *International Journal of Educational Research, 13,* 857-867.

Pressley, M., & Ghatala E. S. (1990). Self-regulated learning: Monitoring learning from text. *Educational Psychologist, 25*(1), 19-33.

Risjord, M. W., Dunbar, S. B., & Maloney, M. F. (2002). A new foundation for methodological triangulation. *Journal of Nursing Scholarship*, *34*(3), 269-276.

Roblyer, M. D. (1999). Is choice important in distance learning? A study of student motives for taking Internet-based courses at the high school and community college levels. *Journal of Research on Computing in Education, 32*(1), 157-171.

Rosenberg, M. J. (2001). *E-learning strategies for delivering knowledge in the digital age.* New York: McGraw Hill.

Rovai, A. P. (2003). The relationships of communicator style, personality-based learning style, and classroom community among online graduate students. *Internet and Higher Education, 6*(4), 347-363.

Royer, J.M., Abranovic, W.A., & Sinatra, G.M. (1987) Using entering reading performance as a predictor of course performance in college classes *Journal of Educational Psychology, 79*, 19-26.

Russell, T. L. (1999). *The no significant difference phenomenon: As reported in 355 research reports, summaries and papers.* Unpublished manuscript, North Carolina State University.

Ryan. M. P. (1984). Monitoring text comprehension: Individual differences in epistemological standards. *Journal of Educational Psychology, 76,* 248-258.

Ryan, R. M. & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *The American Psychologist, 55,* 68-78.

Schiefele, U. (1991). Interest, learning, and motivation. *Educational Psychologist, 26,* 299-323.

Schoenfeld, A. (1983). Beyond the purely cognitive: Belief systems, social cognitions, and metacognitions as driving sources in intellectual performance. *Cognitive Science, 7*(4), 329-363.

Schommer, M. (1990). Effects of belief about the nature of knowledge on comprehension. *Journal of Educational Psychology, 82*(3), 498-504.

Schommer, M. (1993a). Comparisons of beliefs about the nature of knowledge and learning among postsecondary students. *Research in Higher Education, 34*(3), 355-370.

Schommer. M. (1993b). Epistemological development and academic performance among secondary students. *Journal of Educational Psychology, 85*(3), 406-311.

Schommer, M. (1998). The influence of age and education on epistemological beliefs. *British Journal of Educational Psychology, 68,* 551-562.

Schommer, M., Crouse, A., & Rhodes, N. (1992). Epistemological beliefs and mathematical text comprehension: Believing it is simple does not make it so. *Journal of Educational Psychology, 84,* 435-443.

Schommer, M., & Dunnell, P. A. (1994). A comparison of epistemological beliefs between gifted and non-gifted high school students. *Roeper Review, 16,* 207-210.

Schommer, M., Mau, W. C., & Brookhart, S. (2000). Understanding middle students' beliefs about knowledge and learning using a multidimensional paradigm. *The Journal of Educational Research, 94*, 120-127.

Schommer, M., & Walker, K. (1997). Epistemological beliefs and valuing school: Considerations for college admissions and retention. *Research in Higher Education, 38*(2), 173-188.

Schommer-Aikens, M. (2002). An evolving theoretical framework for an epistemological belief system. In B. K. Hofer & P. R. Pintrich (Eds.), *Personal epistemology: The psychology of beliefs about knowledge and knowing (*Vol. 1, pp. 103-118). Mahwah, NJ: Lawrence Erlbaum Associates.

Schommer-Aikens, M., Duell, K., & Barker, S. (2003). Epistemological beliefs across domains using Biglan's classification of academic disciplines. *Research in Higher Education, 44*(3), 347-365.

Schraw, G., Bendixen, L., Dunkle, M. E. (2002). Development and validation of the epistemic belief inventory. In B. K. Hofer, & P. R. Pintrich (Eds.), *Personal epistemology: The psychology of beliefs about knowledge and knowing* (pp. 261-276). Mahwah, NJ: Lawrence Erlbaum Associates.

Schraw, G., & Dennison, R. S. (1994). Assessing metacognitive awareness. *Contemporary Educational Psychology, 19,* 460-475.

Schraw, G., Dunkle, M. E., & Bendixen, L. D. (1995). Cognitive processes in well-defined and ill-defined problem solving. *Applied Cognitive Psychology, 9*, 523-528.

Schunk, D. H. (1994). Self-regulation of self-efficacy and attributions in academic settings. In D. H. Schunk & B. J. Zimmerman (Eds.), *Self-regulation of learning and performance: Issues and educational implications* (pp. 75-99). Hillsdale, NJ: Lawrence Erlbaum Associates.

Schunk, D. H., & Zimmermann, B. J. (1996). Modeling and self-efficacy influences children's development of self-regulation. In J. Juvonen & K. R. Wentzel (Eds.), *Social Motivation: Understanding children's school adjustment* (pp. 154-180). New York: Cambridge University Press.

Shea, P., Fredericksen, E., & Pickett, A., et al. (2000). *Measures of learning effectiveness in the SUNY learning network.* Retrieved November 14, 2004, from State University of New York, Teaching, Learning, and Technology at SUNY Web site: http://tlt.suny.edu/ALNWorkshop2000.doc

Sloan Consortium. (2003a). *Elements of quality on-line education, 2003*. Retrieved November 14, 2004, from http://www.aln.org/publications/books/volume5.asp

Sloan Consortium. (2003b). *Sizing the opportunity: The quality and extent of online education in the United States, 2002 and 2003*. Retrieved November 14, 2004, from http://www.aln.org/publications/books/survey.asp

Spiceland, J. D. (2002). The impact on learning of an asynchronous active learning course format [Electronic version]. *Journal of Asynchronous Learning Networks*, *6*(1). Retrieved November 14, 2004, from http://www.aln.org/publications/jaln/v6n1/pdf/ v6n1_spiceland.pdf

Strijbos, J., Martens, R., & Jochems, W. (2004). Designing for interaction: Six steps to designing computer supported group based learning. *Computers and Education, 42*(4), 403-424.

Swan, K., Shea, P., Fredericksen, E., Pickett, A., Petz, W., & Maher, G. (2000). Building knowledge-building communities: Consistency, contact, and communication in the virtual classroom. *Journal of Educational Computing Research, 23*(4), 359-383.

Thompson, B. R., & Geren, P. R. (2002). Classroom strategies for identifying and helping college students at risk for academic failure. *College Student Journal, 36*(3), 398-402.

Travers, N. L. (2000, May). *Changes in students' self-regulation based on different teaching methodologies.* Paper presented at the 40th Association for Institutional Research Forum: Information for the Next 100 Years, Cincinnati, OH.

Turnbull, E. D. (2003). *Investigating the potential for improving experiential undergraduate curriculum through the concept of personality.* Unpublished doctoral dissertation. University of Western Sydney, Sydney, Australia.

Vanderstoep, S. W., Pintrich, P. R., & Fagerlin, A. (1996). Disciplinary differences in self-regulated learning in college students. *Contemporary Educational Psychology, 21,* 345-362.

VanZile-Tamsen, C. (2001). The predictive power of expectancy of success and task value for college students' self-regulated strategy use. *Journal of College Student Development, 42*, 233-241.

von Glasersfeld, E. (1989). Constructivism in education. In T. Husen & N. Postlewaite (Eds.), *International encyclopedia of education*, (pp.162-163). Oxford, England: Pergamon Press.

Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes.* M. Cole, V. John-Steiner, S. Scribner, & E. Souberman (Eds.). Cambridge, MA: Harvard University Press.

Wang, A. Y., & Newlin, M. H. (2000). Characteristics of students who enroll and succeed in psychology Web-based courses. *Journal of Educational Psychology 92*(1), 137-143.

Wang, A. Y., Newlin, M. H. (2002a). Predictors of performance in the virtual classroom [Electronic version]. *T.H.E. Journal*, Retrieved November 14, 2004, from http://www.thejournal.com/magazine/vault/M2643.cfm

Wang, A. Y., & Newlin, M. H. (2002b). Predictors of Web-student performance: The role of self-efficacy and reasons for taking an on-line class. *Computers in Human Behavior, 18,* 151-163.

Weigel, V. (2002). *Deep learning for a digital age: Technology's untapped potential to enrich higher education*. San Francisco: Jossey-Bass.

Wigfield, A., & Eccles, J. (1992). The development of achievement task values: A theoretical analysis. *Developmental Review, 12,* 265-339.

Williams, W. E. (1996). The relation between efficacy for self-regulated learning and domain-specific academic performance, controlling for test anxiety. *Journal of Research and Development in Education, 29*(2), 77-80.

Williams, J. E., & Hellman, C. M. (1998). Investigating self-regulated learning among first generation community college students. *Journal of Applied Research in the Community College, 5*(2), 83-87.

Williams, P. E., & Hellman, C. M. (2004). Differences in self-regulation for on-line learning between first and second generation college students, *Research in Higher Education, 45*(1), 71-82.

Willis, B. (1993). *Distance education: A practical guide.* Englewood Cliffs, NJ: Educational Technology Publications.

Wolfe, C. R. (2000). Learning and teaching on the World Wide Web. In C. R. Wolfe (Ed.), *Learning and teaching on the World Wide Web* (pp. 1-22). San Diego, CA: Academic Press.

Wolters, C. A. (1998). Self-regulated learning and college students' regulation of motivation. *Journal of Educational Psychology, 90*(2), 224-235.

Wolters, C. A., Pintrich, P. R., & Karabenick, S. A. (2003, March). *Assessing academic self-regulated learning.* Paper delivered at Indicators of Positive Development: Definitions, Measures, and Prospective Validity conference, Washington, D.C.

Young, J. D., (1996). The effect of self-regulated learning strategies on performance in learner controlled computer-based instruction. *Educational Technology Research and Development, 44*(2), 17-27.

Zeidner, M., Boekarts, M., & Pintrich, P. R. (2000). Self-regulation: Directions and challenges for future research. In M. Boekarts, P. R. Pintrich, & M. Zeidner (Eds.), *Handbook of self-regulation* (pp. 750-769). San Diego, CA: Academic Press.

Zimmerman, B. J. (1989a). A social cognitive view of self-regulated academic learning. *Journal of Educational Psychology, 81*(3), 329-339.

Zimmerman, B. J. (1989b). Models of self-regulated learning and academic achievement. In B. J. Zimmerman & D. H. Schunk (Eds.), *Self-regulated learning and academic achievement.* New York: Springer-Verlag.

Zimmerman, B. J. (1990). Self-regulated learning and academic achievement: An overview. *Educational Psychologist, 23*, 3-17.

Zimmerman, B. J. (1994). Dimensions of academic self-regulation: A conceptual framework for education. In D. H. Schunk & B. J. Zimmerman (Eds.), *Self-regulation of learning and performance: Issues and educational applications* (pp. 3-21). Hillsdale, NJ: Erlbaum.

Zimmerman, B. J., (1998). Developing self-fulfilling cycles of academic regulation: An analysis of exemplary instructional models. In Schunk, D. H. and Zimmerman, B. J. (Eds.), *Self-regulated learning: From teaching to reflective practice* (pp. 1-19). Guilford Press: New York.

Zimmerman, B. J. (2000). Attaining self-regulation: A social cognitive perspective. In M. Boekarts, P. R. Pintrich, M. Zeidner (Eds.), *Handbook of self-regulation* (pp. 13-35). San Diego, CA: Academic Press.

Zimmerman, B. J. & Martinez-Pons, M. (1990). Student differences in self-regulated learning: Relating, grade, sex, and giftedness to self-efficacy and strategy use. *Journal of Educational Psychology, 82*(1), 51-59.

Zimmerman, M. C., (2002). Academic self-regulation explains persistence and attrition in Web-based courses: A grounded theory. *Dissertation Abstracts International, 63*(05), 1748A. (UMI No. 3055227)

APPENDICES

APPENDIX A:

SURVEY PARTICIPATION RECRUITMENT MESSAGE

Dear Student first name, last name,
I am an ECU faculty member and NCSU doctoral student conducting a dissertation study of on-line instruction and learning this semester. According to the registrar's records for the spring 2005 semester, you are enrolled in at least one on-line course. I have contacted you in order to ask for your participation in my research study. (If you are not enrolled in any on-line courses or if you feel that you have been contacted in error, then please let me know ASAP).

The study consists of a web–based survey entitled, "survey of on-line undergraduates". It includes demographic question items as well as questions about you as a learner and should not take more than 30-35 minutes for you to complete. Your participation will help me understand how certain learner characteristics influence academic achievement in asynchronous on-line undergraduate courses.

I expect the findings from this research to benefit you as well as other students by guiding instructional design for on-line courses. In addition, the results of this research are also expected to inform policy making about how to include asynchronous on-line instruction in undergraduate settings.

If you decide to participate you will be helping to advance research that looks at the relationship between learner characteristics and success in asynchronous on-line courses. **YOUR PARTICIPATION IS VOLUNTARY AND NOT RELATED IN ANY WAY TO YOUR ULTIMATE GRADE IN THE ON-LINE COURSES (S) YOU ARE TAKING THIS SEMESTER.**

All of your responses will be confidential and your identifying information will only be used to access your fall 2004 GPA and spring 2005 online final course grade. Otherwise, your name and identifying information will not be used in any reports based on this research study. For example, participants will not be identified in any presentation or publication of this research because all data will be treated in aggregated form.

There are no known risks associated with your participation in this research study. All of your responses will be held in strict confidence and only I (as the researcher) will see your individual responses.

This survey is on-line and can be accessed at any time of the day; including weekends. Because it is important to have these survey results before you have completed much of your on-line learning, I urge you to complete the survey as soon as possible. **In appreciation of your participation, I will send you a 25% off coupon that can be used for purchases made at the Dowdy Student Stores.** This coupon will be e-mailed to you after the survey has been completed and submitted. It will be sent to your ECU e-mail address.

BY CLICKING ON THE WEB SURVEY URL BELOW AND COMPLETING THE SURVEY YOU INDICATE YOUR PERMISSION TO ACCESS YOUR FALL 2004 GPA AND YOUR SPRING 2005 FINAL ON-LINE COURSE GRADE.

Once you click on the link below you will be taken to a log in screen that will ask you for your **ECU user id and password**. After you log in, you will then be taken to the survey and can begin completing it. Thank you for deciding to participate in my research study.

The survey URL is:
https://sharepoint.itcs.ecu.edu/surveys/TakeSurvey.asp?PageNumber=1&SurveyID=5MK9831H8896I

If you have questions or concerns about this research or your participation please contact:
Paul Bell, Faculty and Doctoral student
Department of Health Services and Information Management
School of Allied Health Sciences

If you feel that your rights have been violated, you can contact the NCSU IRB office:
919-515-4514
or contact Matt Zingraff: 919-513-1834.

And the ECU IRB office at:

Telephone: 999-999-9999
Fax: 999-999-9999
umcirb@mail.ecu.edu

www.ecu.edu/irb

MAILING ADDRESS
University and Medical Center Institutional Review Board
Life Sciences Building, Room 104
East Carolina University, Brody School of Medicine
Greenville, NC 27834

APPENDIX B:

QUESTIONNAIRE

QUESTIONNAIRE

Demographic items:

1. What is your e-mail ID?
2. Gender: Male, Female
3. Age_____
4. Ethnic background (Non-Hispanic Black, Hispanic, Non-Hispanic White. Asian/Pacific Islander, Native American, Mixed Race.
5. Class level (freshman, sophomore, junior, senior)
6. What is the name and section number of the web based course that you are taking this semester? (if taking more than one course, complete this for the course that is required for either a major or minor course of study).
7. Is this course taught 100% on-line with no scheduled on-campus sessions?
8. Why are you taking this course on-line as opposed to in a campus based classroom?
9. The item that best describes how I feel about my ability to overcome computer and technology related problems:
   1. Not at all confident
   2. Somewhat confident
   3. Confident
   4. Very confident
10. The item that best describes how I feel about my ability to use computer technology such as the Internet, e-mail, and chat:
    1. Not at all confident
    2. Somewhat confident
    3. Confident
    4. Very confident

Self regulation of learning items:

Please indicate how true each of the following statements is of you. There are no right or wrong answers, just answer as accurately as possible. Use the scale below to answer the questions. If you think a statement is very true of you select "7"; if a statement is not at all true of you then select 1. If the statement is more or less true of you then find the number between 1 and 7 that best describes you.

1 2 3 4 5 6 7

Not at all true of me ... Very true of me

19. In a class like this, I prefer course material that really challenges me so I can learn new things.
20. If I study in appropriate ways then I will be able to learn the material in this course
21. I believe I will receive an excellent grade in this class
22. During the times that I am logged onto the course site, I often miss important points because I am thinking of other things
23. I usually study in a place where I can concentrate on my course work
24. I often feel so lazy or bored when I study that I quit before I finish what I planned to do.
25. I prefer course material that arouses my curiosity, even if it is difficult to learn.
26. It is my own fault if I don't learn the material in this course

27. I'm confident I can do an excellent job on the assignments and tests in this course
28. When I become confused about something I'm reading for class, I go back and try to figure it out
29. I make good use of my study time for this course
30. I work hard to do well in class even if I don't like what we are doing
31. The most satisfying thing for me is trying to understand the content as thoroughly as possible
32. If I try hard enough, then I will understand the course material
33. I expect to do well in this class
34. I often find that I have been reading for class but don't know what it was all about
35. I find it hard to stick to a study schedule
36. When course work is difficult, I give up or only study the easy parts.
37. When I have the opportunity, I choose course assignments that I can learn from even if they don't guarantee a good grade.
38. If I don't understand the course material, it is because I didn't try hard enough.
39. Considering the difficulty of this course, the on-line format, and my skills, I think that I will do well in this class.
40. I try to think through a topic and decide what I am supposed to learn from it rather than just reading it over when studying
41. I rarely find time to review my notes or readings before an exam
42. Even when course materials are dull and uninteresting, I manage to keep working until I finish

<u>Epistemological beliefs inventory:</u>

Please indicate how strongly you agree or disagree with each of the statements listed below. Please circle the number that best corresponds to the strength of your belief.

Strongly Disagree 1 2 3 4 5 Strongly Agree

43. It bothers me when instructors don't tell students the answers to complicated problems.
44. Truth means different things to different people.
45. Students who learn things quickly are the most successful.
46. People should always obey the law.
47. Some people will never be smart no matter how hard they work.
48. Absolute moral truth does <u>not</u> exist.
49. Parents should teach their children all there is to know about life.
50. Really smart students don't have to work as hard to do well in school.
51. If a person tries too hard to understand a problem, they will most likely end up being confused.
52. Too many theories just complicate things.
53. The best ideas are often the most simple.
54. People can't do too much about how smart they are.
55. Instructors should focus on facts instead of theories.
56. I like teachers who present several competing theories and let their students decide which is best.
57. How well you do in school depends on how smart you are.
58. If you don't learn something quickly, you won't ever learn it.
59. Some people just have a knack for learning and others don't.

60. Things are simpler than most professors would have you believe.
61. If two people are arguing about something, at least one of them must be wrong.
62. Children should be allowed to question their parents' authority.
63. If you haven't understood a chapter the first time through, going back over it won't help.
64. Science is easy to understand because it contains so many facts.
65. The moral rules I live by apply to everyone.
66. The more you know about a topic, the more there is to know.
67. What is true today will be true tomorrow.
68. Smart people are born that way.
69. When someone in authority tells me what to do, I usually do it.
70. People who question authority are trouble makers.
71. Working on a problem with no quick solution is a waste of time.
72. You can study something for years and still not really understand it.
73. Sometimes there are no right answers to life's big problems.
74. Some people are born with special gifts and talents.

APPENDIX C :

SAS OUTPUT OF CORRELATION MATRIX OF SRL QUESTIONNAIRE ITEMS

The CORR Procedure

24 Variables:	_27_IGO	_28_Expect	_29_SE	_30_Meta	_31_TP	_32_Effreg	_33_IGO
	_34_Expect	_35_SE	_36_Meta	_37_TP	_38_Effreg	_39_IGO	_40_Expect
	_41_SE	_42_Meta	_43_TP	_44_Effreg	_45_IGO	_46_Expect	_47_SE
	_48_Meta	_49_TP	_50_Effreg				

Simple Statistics

Variable	N	Mean	Std Dev	Sum	Minimum	Maximum	Label
_27_IGO	201	4.29851	1.25318	864.00000	1.00000	7.00000	_27_IGO
_28_Expect	201	5.85075	1.24403	1176	1.00000	7.00000	_28_Expect
_29_SE	201	5.75622	1.21048	1157	1.00000	7.00000	_29_SE
_30_Meta	201	5.26866	1.31052	1059	1.00000	7.00000	_30_Meta
_31_TP	201	5.52736	1.20851	1111	2.00000	7.00000	_31_TP
_32_Effreg	201	4.69652	1.57875	944.00000	1.00000	7.00000	_32_Effreg
_33_IGO	201	5.00498	1.40178	1006	1.00000	7.00000	_33_IGO
_34_Expect	201	5.61194	1.34858	1128	2.00000	7.00000	_34_Expect
_35_SE	201	5.85075	1.10798	1176	1.00000	7.00000	_35_SE
_36_Meta	201	5.86070	0.99524	1178	3.00000	7.00000	_36_Meta
_37_TP	201	5.09950	1.29230	1025	1.00000	7.00000	_37_TP
_38_Effreg	201	5.56219	1.16506	1118	2.00000	7.00000	_38_Effreg
_39_IGO	201	4.97015	1.39610	999.00000	1.00000	7.00000	_39_IGO
_40_Expect	201	5.89552	1.06491	1185	2.00000	7.00000	_40_Expect
_41_SE	201	6.10945	1.04305	1228	1.00000	7.00000	_41_SE
_42_Meta	201	4.85075	1.54519	975.00000	1.00000	7.00000	_42_Meta
_43_TP	201	4.22886	1.72550	850.00000	1.00000	7.00000	_43_TP
_44_Effreg	201	5.37313	1.36201	1080	1.00000	7.00000	_44_Effreg
_45_IGO	201	3.84577	1.46666	773.00000	1.00000	7.00000	_45_IGO
_46_Expect	201	4.23881	1.77839	852.00000	1.00000	7.00000	_46_Expect
_47_SE	201	5.78109	1.14971	1162	1.00000	7.00000	_47_SE
_48_Meta	201	4.60697	1.44213	926.00000	1.00000	7.00000	_48_Meta
_49_TP	201	5.46269	1.51653	1098	1.00000	7.00000	_49_TP
_50_Effreg	201	5.10448	1.36163	1026	1.00000	7.00000	_50_Effreg

The CORR Procedure

Pearson Correlation Coefficients, N = 201
Prob > |r| under H0: Rho=0

	_27_IGO	_28_ Expect	_29_SE	_30_Meta	_31_TP	_32_ Effreg	_33_IGO	_34_ Expect
_27_IGO	1.00000	0.21652	0.16655	0.04706	0.01942	0.14594	0.40281	0.01571
_27_IGO		0.0017	0.0165	0.5007	0.7812	0.0359	<.0001	0.8223
_28_Expect	0.21652	1.00000	0.42076	0.19932	0.34350	0.18057	0.18617	0.37123
_28_Expect	0.0017		<.0001	0.0040	<.0001	0.0092	0.0072	<.0001

_29_SE	0.16655	0.42076	1.00000	0.22520	0.06170	0.20934	0.00661	0.18436
_29_SE	0.0165	<.0001		0.0011	0.3772	0.0025	0.9246	0.0078
_30_Meta	0.04706	0.19932	0.22520	1.00000	0.28280	0.35125	0.02820	0.05792
_30_Meta	0.5007	0.0040	0.0011		<.0001	<.0001	0.6867	0.4071
_31_TP	0.01942	0.34350	0.06170	0.28280	1.00000	0.22566	0.11322	0.07374
_31_TP	0.7812	<.0001	0.3772	<.0001		0.0011	0.1043	0.2910
_32_Effreg	0.14594	0.18057	0.20934	0.35125	0.22566	1.00000	-0.05010	-0.01674
_32_Effreg	0.0359	0.0092	0.0025	<.0001	0.0011		0.4734	0.8108
_33_IGO	0.24464	0.18617	0.00661	0.02820	0.11322	-0.05010	1.00000	0.15454
_33_IGO	<.0004	0.0072	0.9246	0.6867	0.1043	0.4734		0.0262
_34_Expect	0.01571	0.37123	0.18436	0.05792	0.07374	-0.01674	0.15454	1.00000
_34_Expect	0.8223	<.0001	0.0078	0.4071	0.2910	0.8108	0.0262	
_35_SE	0.17379	0.41533	0.70178	0.23913	0.12847	0.15622	0.10861	0.31874
_35_SE	0.0123	<.0001	<.0001	0.0005	0.0651	0.0246	0.1193	<.0001
_36_Meta	0.16853	0.38986	0.33598	0.19818	0.28471	0.23863	0.20247	0.26312
_36_Meta	0.0152	<.0001	<.0001	0.0042	<.0001	0.0005	0.0034	0.0001
_37_TP	0.24464	0.26680	0.34859	0.34913	0.21652	0.40217	0.07802	0.12866
_37_TP	0.0004	0.0001	<.0001	<.0001	0.0017	<.0001	0.2638	0.0647
_38_Effreg	0.16218	0.37934	0.36826	0.26337	0.33377	0.25825	0.18070	0.28595
_38_Effreg	0.0196	<.0001	<.0001	0.0001	<.0001	0.0002	0.0092	<.0001
_39_IGO	0.40884	0.26426	0.13622	0.16466	0.20419	0.14006	0.20247	0.10593
_39_IGO	<.0001	0.0001	0.0503	0.0177	0.0032	0.0441	0.0034	0.1287
_40_Expect	0.18021	0.47942	0.32069	0.15010	0.30292	0.12032	0.21976	0.27490
_40_Expect	0.0094	<.0001	<.0001	0.0309	<.0001	0.0842	0.0015	<.0001
_41_SE	0.13472	0.40644	0.76818	0.29275	0.14556	0.18856	0.10473	0.22211
_41_SE	0.0529	<.0001	<.0001	<.0001	0.0364	0.0065	0.1332	0.0013

The CORR Procedure

Pearson Correlation Coefficients, N = 201
Prob > |r| under H0: Rho=0

	_35_SE	_36_Meta	_37_TP	_38_ Effreg	_39_IGO	_40_ Expect	_41_SE	_42_Meta
_27_IGO	0.17379	0.16853	0.24464	0.16218	0.40884	0.18021	0.13472	0.26247
_27_IGO	0.0123	0.0152	0.0004	0.0196	<.0001	0.0094	0.0529	0.0001
_28_Expect	0.41533	0.38986	0.26680	0.37934	0.26426	0.47942	0.40644	0.30392
_28_Expect	<.0001	<.0001	0.0001	<.0001	0.0001	<.0001	<.0001	<.0001
_29_SE	0.70178	0.33598	0.34859	0.36826	0.13622	0.32069	0.76818	0.43025
_29_SE	<.0001	<.0001	<.0001	<.0001	0.0503	<.0001	<.0001	<.0001

_30_Meta	0.23913	0.29817	0.34913	0.26337	0.16466	0.15010	0.29275	0.28693
_30_Meta	0.0005	<.0001	<.0001	0.0001	0.0177	0.0309	<.0001	<.0001
_31_TP	0.12847	0.28471	0.42355	0.33377	0.20419	0.30292	0.14556	0.14294
_31_TP	0.0651	<.0001	<.0001	<.0001	0.0032	<.0001	0.0364	0.0399
_32_Effreg	0.15622	0.23863	0.40217	0.25825	0.14006	0.12032	0.18856	0.39115
_32_Effreg	0.0246	0.0005	<.0001	0.0002	0.0441	0.0842	0.0065	<.0001
_33_IGO	0.10861	0.20247	0.07802	0.18070	0.29801	0.21976	0.10473	0.09013
_33_IGO	0.1193	0.0034	0.2638	0.0092	<.0001	0.0015	0.1332	0.1965
_34_Expect	0.31874	0.26312	0.12866	0.28595	0.10593	0.27490	0.22211	0.12484
_34_Expect	<.0001	0.0001	0.0647	<.0001	0.1287	<.0001	0.0013	0.0731
_35_SE	1.00000	0.41504	0.39088	0.43047	0.21097	0.49364	0.74531	0.35233
_35_SE		<.0001	<.0001	<.0001	0.0023	<.0001	<.0001	<.0001
_36_Meta	0.41504	1.00000	0.47275	0.47227	0.40913	0.33620	0.34962	0.31061
_36_Meta	<.0001		<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
_37_TP	0.39088	0.47275	1.00000	0.58795	0.32726	0.35421	0.36488	0.35859
_37_TP	<.0001	<.0001		<.0001	<.0001	<.0001	<.0001	<.0001
_38_Effreg	0.43047	0.47227	0.58795	1.00000	0.37523	0.38276	0.42723	0.21435
_38_Effreg	<.0001	<.0001	<.0001		<.0001	<.0001	<.0001	0.0019
_39_IGO	0.21097	0.40913	0.32726	0.37523	1.00000	0.41959	0.23500	0.09044
_39_IGO	0.0023	<.0001	<.0001	<.0001		<.0001	0.0007	0.1950
_40_Expect	0.49364	0.33620	0.35421	0.38276	0.41959	1.00000	0.47295	0.16813
_40_Expect	<.0001	<.0001	<.0001	<.0001	<.0001		<.0001	0.0155
_41_SE	0.74531	0.34962	0.36488	0.42723	0.23500	0.47295	1.00000	0.38833
_41_SE	<.0001	<.0001	<.0001	<.0001	0.0007	<.0001		<.0001

The CORR Procedure

Pearson Correlation Coefficients, N = 201
Prob > |r| under H0: Rho=0

	_43_TP	_44_ Effreg	_45_IGO	_46_ Expect	_47_SE	_48_Meta	_49_TP	_50_ Effreg
_27_IGO	0.14203	0.17412	0.24935	-0.05104	0.15124	0.04160	0.08040	0.19810
_27_IGO	0.0412	0.0121	0.0003	0.4651	0.0296	0.5517	0.2495	0.0042
_28_Expect	0.13933	0.31951	0.11078	0.21769	0.46618	0.20311	0.24922	0.29981
_28_Expect	0.0453	<.0001	0.1120	0.0016	<.0001	0.0033	0.0003	<.0001
_29_SE	0.21900	0.28428	-0.01682	0.08530	0.73426	-0.00298	0.34363	0.21301
_29_SE	0.0015	<.0001	0.8099	0.2217	<.0001	0.9661	<.0001	0.0021
_30_Meta	0.30279	0.35062	-0.08242	-0.06822	0.34212	0.08127	0.28193	0.29011

_30_Meta	<.0001	<.0001	0.2377	0.3287	<.0001	0.2444	<.0001	<.0001
_31_TP	0.23689	0.32847	0.00943	0.05757	0.15050	0.28445	0.22123	0.32412
_31_TP	0.0006	<.0001	0.8927	0.4100	0.0304	<.0001	0.0014	<.0001
_32_Effreg	0.55733	0.42034	-0.09181	-0.02769	0.13999	0.14205	0.34427	0.38659
_32_Effreg	<.0001	<.0001	0.1883	0.6921	0.0442	0.0412	<.0001	<.0001
_33_IGO	-0.11522	0.12862	0.24464	0.12790	0.05463	0.17295	-0.00259	0.07193
_33_IGO	0.0983	0.0648	0.0004	0.0663	0.4344	0.0127	0.9704	0.3030
_34_Expect	0.00546	0.15197	0.10889	0.32111	0.27620	0.20176	0.07571	0.18057
_34_Expect	0.9377	0.0288	0.1183	<.0001	<.0001	0.0036	0.2782	0.0092
_35_SE	0.20065	0.28575	0.04687	0.07282	0.71331	0.16174	0.31867	0.28671
_35_SE	0.0037	<.0001	0.5024	0.2971	<.0001	0.0199	<.0001	<.0001
_36_Meta	0.19266	0.35766	0.15604	-0.03967	0.38200	0.23133	0.32139	0.38875
_36_Meta	0.0054	<.0001	0.0248	0.5704	<.0001	0.0008	<.0001	<.0001
_37_TP	0.42399	0.42678	0.11800	-0.09394	0.34368	0.23275	0.32080	0.49900
_37_TP	<.0001	<.0001	0.0904	0.1782	<.0001	0.0007	<.0001	<.0001
_38_Effreg	0.22044	0.37336	0.02978	-0.04887	0.41107	0.25103	0.38878	0.51173
_38_Effreg	0.0014	<.0001	0.6701	0.4844	<.0001	0.0003	<.0001	<.0001
_39_IGO	0.13624	0.19818	0.41980	-0.02371	0.11018	0.27120	0.06438	0.38519
_39_IGO	0.0503	0.0042	<.0001	0.7345	0.1140	<.0001	0.3567	<.0001
_40_Expect	0.06098	0.28611	0.15911	0.27364	0.42715	0.22391	0.25545	0.33313
_40_Expect	0.3827	<.0001	0.0220	<.0001	<.0001	0.0012	0.0002	<.0001
_41_SE	0.22672	0.31746	0.02003	0.11438	0.73833	0.13265	0.29030	0.23062
_41_SE	0.0010	<.0001	0.7746	0.1008	<.0001	0.0567	<.0001	0.0008

The CORR Procedure

Pearson Correlation Coefficients, N = 201
Prob > |r| under H0: Rho=0

	_27_IGO	_28_ Expect	_29_SE	_30_Meta	_31_TP	_32_ Effreg	_33_IGO	_34_ Expect
_42_Meta	0.26247	0.30392	0.43025	0.28693	0.14294	0.39115	0.09013	0.12484
_42_Meta	0.0001	<.0001	<.0001	<.0001	0.0399	<.0001	0.1965	0.0731
_43_TP	0.14203	0.13933	0.21900	0.30279	0.21097	0.55733	-0.11522	0.00546
_43_TP	0.0412	0.0453	0.0015	<.0001	0.0023	<.0001	0.0983	0.9377
_44_Effreg	0.17412	0.31951	0.28428	0.35062	0.32847	0.21900	0.12862	0.15197
_44_Effreg	0.0121	<.0001	<.0001	<.0001	<.0001	0.0015	0.0648	0.0288
_45_IGO	0.30279	0.11078	-0.01682	-0.08242	0.00943	-0.09181	0.26509	0.10889
_45_IGO	<.0001	0.1120	0.8099	0.2377	0.8927	0.1883	0.0001	0.1183

_46_Expect	-0.05104	0.21769	0.08530	-0.06822	0.05757	-0.02769	0.12790	0.23133
_46_Expect	0.4651	0.0016	0.2217	0.3287	0.4100	0.6921	0.0663	0.0008
_47_SE	0.15124	0.46618	0.73426	0.34212	0.15050	0.13999	0.05463	0.27620
_47_SE	0.0296	<.0001	<.0001	<.0001	0.0304	0.0442	0.4344	<.0001
_48_Meta	0.04160	0.20311	-0.00298	0.08127	0.28445	0.14205	0.17295	0.20176
_48_Meta	0.5517	0.0033	0.9661	0.2444	<.0001	0.0412	0.0127	0.0036
_49_TP	0.08040	0.24922	0.34363	0.18057	0.22123	0.34427	-0.00259	0.07571
_49_TP	0.2495	0.0003	<.0001	0.0092	0.0014	<.0001	0.9704	0.2782
_50_Effreg	0.19810	0.29981	0.21301	0.29011	0.32412	0.19266	0.07193	0.18057
_50_Effreg	0.0042	<.0001	0.0021	<.0001	<.0001	0.0054	0.3030	0.0092

Pearson Correlation Coefficients, N = 201
Prob > |r| under H0: Rho=0

	_35_SE	_36_Meta	_37_TP	_38_ Effreg	_39_IGO	_40_ Expect	_41_SE	_42_Meta
_42_Meta	0.35233	0.31061	0.35859	0.21435	0.09044	0.16813	0.38833	1.00000
_42_Meta	<.0001	<.0001	<.0001	0.0019	0.1950	0.0155	<.0001	
_43_TP	0.20065	0.19266	0.42399	0.22044	0.13624	0.06098	0.22672	0.49215
_43_TP	0.0037	0.0054	<.0001	0.0014	0.0503	0.3827	0.0010	<.0001
_44_Effreg	0.28575	0.35766	0.42678	0.37336	0.19818	0.28611	0.31746	0.46545
_44_Effreg	<.0001	<.0001	<.0001	<.0001	0.0042	<.0001	<.0001	<.0001
_45_IGO	0.04687	0.15604	0.11800	0.02978	0.41980	0.15911	0.02003	-0.09556
_45_IGO	0.5024	0.0248	0.0904	0.6701	<.0001	0.0220	0.7746	0.1708

The CORR Procedure

Pearson Correlation Coefficients, N = 201
Prob > |r| under H0: Rho=0

	_35_SE	_36_Meta	_37_TP	_38_ Effreg	_39_IGO	_40_ Expect	_41_SE	_42_Meta
_46_Expect	0.07282	-0.03967	-0.09394	-0.04887	-0.02371	0.24464	0.11438	0.01127
_46_Expect	0.2971	0.5704	0.1782	0.4844	0.7345	0.0004	0.1008	0.8719
_47_SE	0.71331	0.38200	0.34368	0.41107	0.11018	0.42715	0.73833	0.42729
_47_SE	<.0001	<.0001	<.0001	<.0001	0.1140	<.0001	<.0001	<.0001
_48_Meta	0.16174	0.23133	0.23275	0.25103	0.27120	0.22391	0.13265	0.08644
_48_Meta	0.0199	0.0008	0.0007	0.0003	<.0001	0.0012	0.0567	0.2155
_49_TP	0.31867	0.32139	0.32080	0.38878	0.06438	0.25545	0.29030	0.30510
_49_TP	<.0001	<.0001	<.0001	<.0001	0.3567	0.0002	<.0001	<.0001
_50_Effreg	0.28671	0.38875	0.49900	0.51173	0.38519	0.33313	0.23062	0.26596
_50_Effreg	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	0.0008	0.0001

Pearson Correlation Coefficients, N = 201
Prob > |r| under H0: Rho=0

	_43_TP	_44_ Effreg	_45_IGO	_46_ Expect	_47_SE	_48_Meta	_49_TP	_50_ Effreg
_42_Meta	0.49215	0.46545	-0.09556	0.01127	0.42729	0.08644	0.30510	0.26596
_42_Meta	<.0001	<.0001	0.1708	0.8719	<.0001	0.2155	<.0001	0.0001
_43_TP	1.00000	0.47188	-0.07814	-0.07828	0.15093	0.10192	0.38046	0.30834
_43_TP		<.0001	0.2631	0.2622	0.0299	0.1439	<.0001	<.0001
_44_Effreg	0.47188	1.00000	0.02615	-0.15203	0.37869	0.18562	0.50904	0.38572
_44_Effreg	<.0001		0.7083	0.0288	<.0001	0.0074	<.0001	<.0001
_45_IGO	-0.07814	0.02615	1.00000	-0.00350	0.03046	0.14149	-0.04153	0.15232
_45_IGO	0.2631	0.7083		0.9600	0.6631	0.0420	0.5525	0.0285
_46_Expect	-0.07828	-0.15203	-0.00350	1.00000	0.17627	0.11732	-0.09602	-0.04480
_46_Expect	0.2622	0.0288	0.9600		0.0111	0.0923	0.1687	0.5215
_47_SE	0.15093	0.37869	0.03046	0.17627	1.00000	0.12806	0.34610	0.29919
_47_SE	0.0299	<.0001	0.6631	0.0111		0.0659	<.0001	<.0001
_48_Meta	0.10192	0.18562	0.14149	0.11732	0.12806	1.00000	0.03643	0.19257
_48_Meta	0.1439	0.0074	0.0420	0.0923	0.0659		0.6023	0.0054
_49_TP	0.38046	0.50904	-0.04153	-0.09602	0.34610	0.03643	1.00000	0.30971
_49_TP	<.0001	<.0001	0.5525	0.1687	<.0001	0.6023		<.0001

The CORR Procedure

Pearson Correlation Coefficients, N = 201
Prob > |r| under H0: Rho=0

	_43_TP	_44_ Effreg	_45_IGO	_46_ Expect	_47_SE	_48_Meta	_49_TP	_50_ Effreg
_50_Effreg	0.30834	0.38572	0.15232	-0.04480	0.29919	0.19257	0.30971	1.00000
_50_Effreg	<.0001	<.0001	0.0285	0.5215	<.0001	0.0054	<.0001	

APPENDIX D:

SAS OUTPUT OF CORRELATION MATRIX OF EB QUESTIONAIRE ITEMS

The SAS System 15:54 Tuesday, June 14, 2005 1

The CORR Procedure

32 Variables: _51_SK _52_CK _53_QL _54_OA _55_IA _56_CK _57_OA _58_IA
_59_QL _60_SK _61_SK _62_IA _63_SK _64_CK _65_IA _66_QL
_67_IA _68_SK _69_CK _70_OA _71_QL _72_CK _73_CK _74_SK
_75_CK _76_IA _77_OA _78_OA _79_QL _80_SK _81_CK _82_IA

Simple Statistics

Variable	N	Mean	Std Dev	Sum	Minimum	Maximum	Label
_51_SK	201	4.27363	0.95904	859.00000	1.00000	5.00000	_51_SK
_52_CK	201	2.06965	1.18115	416.00000	1.00000	5.00000	_52_CK
_53_QL	201	2.58706	1.10618	520.00000	1.00000	5.00000	_53_QL
_54_OA	201	3.98010	0.93252	800.00000	1.00000	5.00000	_54_OA
_55_IA	201	2.24876	1.13922	452.00000	1.00000	5.00000	_55_IA
_56_CK	201	3.73134	1.15649	750.00000	1.00000	5.00000	_56_CK
_57_OA	201	3.06965	1.15114	617.00000	1.00000	5.00000	_57_OA
_58_IA	201	2.99005	1.26487	601.00000	1.00000	5.00000	_58_IA
_59_QL	201	2.80597	1.08957	564.00000	1.00000	5.00000	_59_QL
_60_SK	201	3.29851	1.05378	663.00000	1.00000	5.00000	_60_SK
_61_SK	201	3.88557	0.96532	781.00000	1.00000	5.00000	_61_SK
_62_IA	201	2.32338	1.09540	467.00000	1.00000	5.00000	_62_IA
_63_SK	201	3.03980	1.03364	611.00000	1.00000	5.00000	_63_SK
_64_CK	201	2.57711	1.06079	518.00000	1.00000	5.00000	_64_CK
_65_IA	201	2.26866	1.01856	456.00000	1.00000	5.00000	_65_IA
_66_QL	201	1.59204	0.80792	320.00000	1.00000	5.00000	_66_QL
_67_IA	201	3.21393	1.10860	646.00000	1.00000	5.00000	_67_IA
_68_SK	201	3.14925	0.93681	633.00000	1.00000	5.00000	_68_SK
_69_CK	201	1.81095	0.96129	364.00000	1.00000	5.00000	_69_CK
_70_OA	201	3.47264	1.07726	698.00000	1.00000	5.00000	_70_OA
_71_QL	201	1.52239	0.76860	306.00000	1.00000	5.00000	_71_QL
_72_CK	201	2.41294	1.09710	485.00000	1.00000	5.00000	_72_CK
_73_CK	201	2.29851	1.15778	462.00000	1.00000	5.00000	_73_CK
_74_SK	201	2.32338	0.92190	467.00000	1.00000	5.00000	_74_SK
_75_CK	201	2.27861	1.04019	458.00000	1.00000	5.00000	_75_CK
_76_IA	201	2.38308	1.02348	479.00000	1.00000	5.00000	_76_IA
_77_OA	201	3.85572	0.92416	775.00000	1.00000	5.00000	_77_OA
_78_OA	201	2.52239	0.97506	507.00000	1.00000	5.00000	_78_OA
_79_QL	201	1.76617	0.86605	355.00000	1.00000	5.00000	_79_QL
_80_SK	201	2.27363	1.04869	457.00000	1.00000	5.00000	_80_SK
_81_CK	201	1.89055	1.01880	380.00000	1.00000	5.00000	_81_CK
_82_IA	201	4.44279	0.79244	893.00000	1.00000	5.00000	_82_IA

The SAS System 15:54 Tuesday, June 14, 2005 2

The CORR Procedure

Pearson Correlation Coefficients, N = 201
Prob > |r| under H0: Rho=0

	_51_SK	_52_CK	_53_QL	_54_OA	_55_IA	_56_CK	_57_OA	_58_IA	_59_QL
_51_SK	1.00000	-0.34830	-0.02028	0.01708	-0.00098	-0.10565	0.01943	0.01240	0.08379

_51_SK		<.0001	0.7717	0.8070	0.9888	0.1298	0.7811	0.8592	0.2300
_52_CK	-0.34830	1.00000	-0.07718	0.03737	-0.14227	0.09466	-0.02526	-0.16966	-0.09938
_52_CK	<.0001		0.2690	0.5929	0.0409	0.1749	0.7178	0.0145	0.1542
_53_QL	-0.02028	-0.07718	1.00000	-0.00078	0.30608	-0.13269	0.05347	0.32794	0.10482
_53_QL	0.7717	0.2690		0.9912	<.0001	0.0567	0.4441	<.0001	0.1328
_54_OA	0.01708	0.03737	-0.00078	1.00000	-0.16273	0.24438	0.17789	-0.01660	0.05788
_54_OA	0.8070	0.5929	0.9912		0.0191	0.0004	0.0103	0.8124	0.4074
_55_IA	-0.00098	-0.14227	0.30608	-0.16273	1.00000	-0.16790	-0.07799	0.29678	-0.00804
_55_IA	0.9888	0.0409	<.0001	0.0191		0.0156	0.2640	<.0001	0.9084
_56_CK	-0.10565	0.09466	-0.13269	0.24438	-0.16790	1.00000	0.07737	-0.13951	-0.04352
_56_CK	0.1298	0.1749	0.0567	0.0004	0.0156		0.2678	0.0450	0.5335
_57_OA	0.01943	-0.02526	0.05347	0.17789	-0.07799	0.07737	1.00000	-0.14077	-0.02436
_57_OA	0.7811	0.7178	0.4441	0.0103	0.2640	0.2678		0.0431	0.7275
_58_IA	0.01240	-0.16966	0.32794	-0.01660	0.29678	-0.13951	-0.14077	1.00000	0.29253
_58_IA	0.8592	0.0145	<.0001	0.8124	<.0001	0.0450	0.0431		<.0001
_59_QL	0.08379	-0.09938	0.10482	0.05788	-0.00804	-0.04352	-0.02436	0.29253	1.00000
_59_QL	0.2300	0.1542	0.1328	0.4074	0.9084	0.5335	0.7275	<.0001	
_60_SK	0.04234	-0.03949	0.03065	0.00619	0.13604	0.00040	0.01312	0.16715	0.42658
_60_SK	0.5447	0.5721	0.6611	0.9295	0.0506	0.9955	0.8511	0.0161	<.0001
_61_SK	0.17563	-0.22712	-0.05732	0.09948	-0.04319	-0.08844	0.05060	0.08057	0.15891
_61_SK	0.0114	0.0010	0.4120	0.1538	0.5367	0.2051	0.4691	0.2485	0.0222
_62_IA	0.05545	-0.11172	0.18007	0.02616	0.24438	-0.18305	0.14335	0.22266	0.11924
_62_IA	0.4274	0.1090	0.0094	0.7083	0.0004	0.0083	0.0393	0.0013	0.0870
_63_SK	0.10431	-0.01135	0.08423	0.10489	0.08156	-0.02025	0.00959	0.11102	0.25944
_63_SK	0.1347	0.8710	0.2275	0.1326	0.2427	0.7722	0.8909	0.1113	0.0002
_64_CK	0.00504	0.14178	-0.00839	0.07849	-0.10018	0.08332	0.00281	-0.05269	0.10103
_64_CK	0.9425	0.0416	0.9045	0.2610	0.1509	0.2326	0.9680	0.4509	0.1475
_65_IA	-0.05274	0.00558	0.33374	0.01019	0.39379	-0.05891	0.10114	0.29091	0.04821
_65_IA	0.4504	0.9364	<.0001	0.8842	<.0001	0.3992	0.1470	<.0001	0.4903

The SAS System 15:54 Tuesday, June 14, 2005 3

The CORR Procedure

Pearson Correlation Coefficients, N = 201
Prob > |r| under H0: Rho=0

	_60_SK	_61_SK	_62_IA	_63_SK	_64_CK	_65_IA	_66_QL	_67_IA	_68_SK
_51_SK	0.04234	0.17563	0.05545	0.10431	0.00504	-0.05274	-0.09252	0.12493	0.02050
_51_SK	0.5447	0.0114	0.4274	0.1347	0.9425	0.4504	0.1849	0.0729	0.7694
_52_CK	-0.03949	-0.22712	-0.11172	-0.01135	0.14178	0.00558	0.04665	-0.11248	-0.09104

_52_CK	0.5721	0.0010	0.1090	0.8710	0.0416	0.9364	0.5045	0.1066	0.1920
_53_QL	0.03065	-0.05732	0.18007	0.08423	-0.00839	0.33374	0.23919	0.18254	-0.05709
_53_QL	0.6611	0.4120	0.0094	0.2275	0.9045	<.0001	0.0005	0.0085	0.4139
_54_OA	0.00619	0.09948	0.02616	0.10489	0.07849	0.01019	-0.09476	-0.05175	0.09945
_54_OA	0.9295	0.1538	0.7083	0.1326	0.2610	0.8842	0.1744	0.4590	0.1540
_55_IA	0.13604	-0.04319	0.37448	0.08156	-0.10018	0.39379	0.35440	0.41613	0.09275
_55_IA	0.0506	0.5367	<.0001	0.2427	0.1509	<.0001	<.0001	<.0001	0.1838
_56_CK	0.00040	-0.08844	-0.18305	-0.02025	0.08332	-0.05891	-0.23312	-0.10243	0.01195
_56_CK	0.9955	0.2051	0.0083	0.7722	0.2326	0.3992	0.0007	0.1419	0.8643
_57_OA	0.01312	0.05060	0.14335	0.00959	0.00281	0.10114	-0.01396	-0.07364	0.11339
_57_OA	0.8511	0.4691	0.0393	0.8909	0.9680	0.1470	0.8418	0.2916	0.1038
_58_IA	0.16715	0.08057	0.22266	0.11102	-0.05269	0.29091	0.15087	0.34381	-0.01404
_58_IA	0.0161	0.2485	0.0013	0.1113	0.4509	<.0001	0.0300	<.0001	0.8408
_59_QL	0.42658	0.15891	0.11924	0.25944	0.10103	0.04821	0.11795	0.04696	0.28563
_59_QL	<.0001	0.0222	0.0870	0.0002	0.1475	0.4903	0.0905	0.5016	<.0001
_60_SK	1.00000	0.15085	0.25261	0.48104	0.31066	0.17993	0.12933	0.14039	0.31304
_60_SK		0.0300	0.0002	<.0001	<.0001	0.0095	0.0633	0.0436	<.0001
_61_SK	0.15085	1.00000	0.05456	0.14155	-0.07443	-0.13757	-0.04259	0.05591	0.21528
_61_SK	0.0300		0.4349	0.0419	0.2865	0.0481	0.5423	0.4236	0.0018
_62_IA	0.25261	0.05456	1.00000	0.31304	0.03438	0.26429	0.33390	0.35867	0.04271
_62_IA	0.0002	0.4349		<.0001	0.6229	0.0001	<.0001	<.0001	0.5412
_63_SK	0.48104	0.14155	0.31304	1.00000	0.33922	0.10730	0.13764	0.15481	0.30019
_63_SK	<.0001	0.0419	<.0001		<.0001	0.1238	0.0480	0.0259	<.0001
_64_CK	0.31066	-0.07443	0.03438	0.33922	1.00000	-0.04311	-0.08847	0.03034	0.02539
_64_CK	<.0001	0.2865	0.6229	<.0001		0.5374	0.2049	0.6643	0.7165
_65_IA	0.17993	-0.13757	0.26429	0.10730	-0.04311	1.00000	0.53088	0.34497	-0.00348
_65_IA	0.0095	0.0481	0.0001	0.1238	0.5374		<.0001	<.0001	0.9603

The CORR Procedure

Pearson Correlation Coefficients, N = 201
Prob > |r| under H0: Rho=0

	_69_CK	_70_OA	_71_QL	_72_CK	_73_CK	_74_SK	_75_CK	_76_IA	_77_OA
_51_SK	-0.17391	0.04947	-0.07181	-0.06766	-0.06844	-0.14875	-0.10119	-0.12448	0.06486
_51_SK	0.0122	0.4790	0.3038	0.3327	0.3272	0.0324	0.1468	0.0739	0.3531
_52_CK	0.06240	0.14585	0.01325	0.07441	0.17077	0.15752	0.14990	0.02974	0.03001
_52_CK	0.3717	0.0360	0.8497	0.2866	0.0139	0.0234	0.0311	0.6705	0.6677
_53_QL	0.13142	-0.17296	0.16912	0.08518	0.08250	0.03683	0.20838	0.21507	0.01097

_53_QL	0.0591	0.0127	0.0148	0.2223	0.2373	0.5983	0.0026	0.0019	0.8754
_54_OA	0.04470	0.16237	-0.01164	0.00219	0.11152	-0.03584	0.16707	-0.04521	0.28909
_54_OA	0.5225	0.0194	0.8678	0.9751	0.1096	0.6082	0.0161	0.5177	<.0001
_55_IA	0.14589	-0.13147	0.16359	-0.02268	0.03010	0.00900	0.05276	0.41468	-0.03050
_55_IA	0.0360	0.0590	0.0185	0.7457	0.6668	0.8976	0.4502	<.0001	0.6627
_56_CK	0.03488	0.16590	-0.03376	-0.09588	0.06912	0.02164	0.02183	-0.00392	0.05649
_56_CK	0.6178	0.0169	0.6291	0.1694	0.3224	0.7570	0.7549	0.9553	0.4188
_57_OA	0.18203	0.07701	0.08674	0.05408	0.20419	-0.13244	0.20303	-0.01552	-0.04066
_57_OA	0.0087	0.2700	0.2140	0.4390	0.0032	0.0571	0.0033	0.8244	0.5608
_58_IA	0.06454	-0.03909	0.02982	-0.05231	-0.04571	-0.05278	0.09925	0.32339	0.05092
_58_IA	0.3556	0.5761	0.6698	0.4541	0.5131	0.4501	0.1548	<.0001	0.4662
_59_QL	0.18465	-0.01260	0.10118	0.04709	0.04834	-0.06566	0.19717	0.08253	0.17077
_59_QL	0.0077	0.8570	0.1469	0.5005	0.4891	0.3473	0.0044	0.2371	0.0139
_60_SK	0.22006	0.01968	0.14727	0.09682	0.21532	0.05247	0.14067	0.11916	0.10010
_60_SK	0.0014	0.7784	0.0342	0.1652	0.0018	0.4527	0.0432	0.0872	0.1513
_61_SK	0.12896	0.00701	-0.00502	0.11591	0.00792	-0.14430	0.00690	-0.00043	0.09091
_61_SK	0.0640	0.9201	0.9428	0.0963	0.9098	0.0380	0.9214	0.9951	0.1927
_62_IA	0.12732	-0.06890	0.24078	0.13073	0.09923	0.05903	0.14813	0.22765	-0.09665
_62_IA	0.0675	0.3239	0.0005	0.0604	0.1549	0.3981	0.0332	0.0010	0.1660
_63_SK	0.13679	0.06615	0.14828	0.03220	0.13016	0.10099	0.12700	0.04284	0.19969
_63_SK	0.0494	0.3436	0.0330	0.6450	0.0616	0.1477	0.0682	0.5400	0.0039
_64_CK	-0.03334	0.13045	0.06355	-0.08350	0.07234	0.13614	0.02208	-0.06058	0.09772
_64_CK	0.6334	0.0610	0.3630	0.2316	0.3003	0.0505	0.7522	0.3858	0.1613
_65_IA	0.21564	-0.08549	0.21333	0.03396	0.23286	-0.07034	0.28909	0.34243	0.05219
_65_IA	0.0018	0.2206	0.0020	0.6272	0.0007	0.3138	<.0001	<.0001	0.4551

The SAS System 15:54 Tuesday, June 14, 2005 5

The CORR Procedure

Pearson Correlation Coefficients, N = 201
Prob > |r| under H0: Rho=0

	_78_OA	_79_QL	_80_SK	_81_CK	_82_IA
_51_SK	-0.00098	-0.12410	-0.11953	-0.14304	0.15351
_51_SK	0.9888	0.0748	0.0863	0.0398	0.0272
_52_CK	0.18753	0.07500	0.10251	0.06433	-0.09106
_52_CK	0.0068	0.2828	0.1416	0.3571	0.1919
_53_QL	-0.00004	0.22889	-0.00663	0.06386	-0.08907
_53_QL	0.9995	0.0009	0.9245	0.3607	0.2018
_54_OA	0.32339	0.01872	0.16213	0.07034	0.02203

_54_OA	<.0001	0.7889	0.0196	0.3139	0.7528
_55_IA	-0.05079	0.17022	-0.04269	-0.07862	0.03815
_55_IA	0.4673	0.0142	0.5414	0.2601	0.5852
_56_CK	0.08706	-0.04389	0.04632	0.23530	0.06194
_56_CK	0.2123	0.5300	0.5075	0.0006	0.3753
_57_OA	0.12557	0.08570	-0.07683	-0.01050	0.00182
_57_OA	0.0714	0.2195	0.2712	0.8806	0.9793
_58_IA	0.08970	0.08326	-0.13425	-0.07640	0.11270
_58_IA	0.1987	0.2330	0.0538	0.2739	0.1059
_59_QL	0.05951	0.14555	-0.16135	-0.01219	0.04291
_59_QL	0.3943	0.0364	0.0202	0.8616	0.5393
_60_SK	0.14024	0.24829	-0.09358	-0.06530	0.09389
_60_SK	0.0439	0.0003	0.1799	0.3499	0.1784
_61_SK	-0.02134	-0.07441	-0.11322	-0.17183	0.13559
_61_SK	0.7602	0.2866	0.1043	0.0133	0.0514
_62_IA	0.11544	0.27357	0.07923	0.07198	-0.04938
_62_IA	0.0976	<.0001	0.2565	0.3027	0.4798
_63_SK	0.23356	0.27399	-0.08642	0.02804	0.03295
_63_SK	0.0007	<.0001	0.2157	0.6884	0.6375
_64_CK	0.08629	0.10271	0.04200	0.07523	0.00320
_64_CK	0.2164	0.1408	0.5479	0.2813	0.9635
_65_IA	0.26097	0.27000	-0.15939	-0.09822	0.01156
_65_IA	0.0001	<.0001	0.0218	0.1591	0.8686

The CORR Procedure

Pearson Correlation Coefficients, N = 201
Prob > |r| under H0: Rho=0

	_51_SK	_52_CK	_53_QL	_54_OA	_55_IA	_56_CK	_57_OA	_58_IA	_59_QL
_66_QL	-0.09252	0.04665	0.23919	-0.09476	0.35440	-0.23312	-0.01396	0.15087	0.11795
_66_QL	0.1849	0.5045	0.0005	0.1744	<.0001	0.0007	0.8418	0.0300	0.0905
_67_IA	0.12493	-0.11248	0.18254	-0.05175	0.41613	-0.10243	-0.07364	0.34381	0.04696
_67_IA	0.0729	0.1066	0.0085	0.4590	<.0001	0.1419	0.2916	<.0001	0.5016
_68_SK	0.02050	-0.09104	-0.05709	0.09945	0.09275	0.01195	0.11339	-0.01404	0.28563
_68_SK	0.7694	0.1920	0.4139	0.1540	0.1838	0.8643	0.1038	0.8408	<.0001
_69_CK	-0.17391	0.06240	0.13142	0.04470	0.14589	0.03488	0.18203	0.06454	0.18465
_69_CK	0.0122	0.3717	0.0591	0.5225	0.0360	0.6178	0.0087	0.3556	0.0077
_70_OA	0.04947	0.14585	-0.17296	0.16237	-0.13147	0.16590	0.07701	-0.03909	-0.01260

_70_OA	0.4790	0.0360	0.0127	0.0194	0.0590	0.0169	0.2700	0.5761	0.8570
_71_QL	-0.07181	0.01325	0.16912	-0.01164	0.16359	-0.03376	0.08674	0.02982	0.10118
_71_QL	0.3038	0.8497	0.0148	0.8678	0.0185	0.6291	0.2140	0.6698	0.1469
_72_CK	-0.06766	0.07441	0.08518	0.00219	-0.02268	-0.09588	0.05408	-0.05231	0.04709
_72_CK	0.3327	0.2866	0.2223	0.9751	0.7457	0.1694	0.4390	0.4541	0.5005
_73_CK	-0.06844	0.27282	0.08250	0.11152	0.03010	0.06912	0.20419	-0.04571	0.04834
_73_CK	0.3272	<.0001	0.2373	0.1096	0.6668	0.3224	0.0032	0.5131	0.4891
_74_SK	-0.14875	0.15752	0.03683	-0.03584	0.00900	0.02164	-0.13244	-0.05278	-0.06566
_74_SK	0.0324	0.0234	0.5983	0.6082	0.8976	0.7570	0.0571	0.4501	0.3473
_75_CK	-0.10119	0.14990	0.20838	0.16707	0.05276	0.02183	0.20303	0.09925	0.19717
_75_CK	0.1468	0.0311	0.0026	0.0161	0.4502	0.7549	0.0033	0.1548	0.0044
_76_IA	-0.12448	0.02974	0.21507	-0.04521	0.41468	-0.00392	-0.01552	0.32339	0.08253
_76_IA	0.0739	0.6705	0.0019	0.5177	<.0001	0.9553	0.8244	<.0001	0.2371
_77_OA	0.06486	0.03001	0.01097	0.22910	-0.03050	0.05649	-0.04066	0.05092	0.17077
_77_OA	0.3531	0.6677	0.8754	0.0009	0.6627	0.4188	0.5608	0.4662	0.0139
_78_OA	-0.00098	0.18753	-0.00004	0.24448	-0.05079	0.08706	0.12557	0.08970	0.05951
_78_OA	0.9888	0.0068	0.9995	0.0004	0.4673	0.2123	0.0714	0.1987	0.3943
_79_QL	-0.12410	0.07500	0.22889	0.01872	0.17022	-0.04389	0.08570	0.08326	0.14555
_79_QL	0.0748	0.2828	0.0009	0.7889	0.0142	0.5300	0.2195	0.2330	0.0364
_80_SK	-0.11953	0.10251	-0.00663	0.16213	-0.04269	0.04632	-0.07683	-0.13425	-0.16135
_80_SK	0.0863	0.1416	0.9245	0.0196	0.5414	0.5075	0.2712	0.0538	0.0202

The CORR Procedure

Pearson Correlation Coefficients, N = 201
Prob > |r| under H0: Rho=0

	_60_SK	_61_SK	_62_IA	_63_SK	_64_CK	_65_IA	_66_QL	_67_IA	_68_SK
_66_QL	0.12933	-0.04259	0.33390	0.13764	-0.08847	0.53088	1.00000	0.24434	0.09055
_66_QL	0.0633	0.5423	<.0001	0.0480	0.2049	<.0001		0.0004	0.1944
_67_IA	0.14039	0.05591	0.35867	0.15481	0.03034	0.34497	0.24434	1.00000	0.13051
_67_IA	0.0436	0.4236	<.0001	0.0259	0.6643	<.0001	0.0004		0.0609
_68_SK	0.31304	0.21528	0.04271	0.30019	0.02539	-0.00348	0.09055	0.13051	1.00000
_68_SK	<.0001	0.0018	0.5412	<.0001	0.7165	0.9603	0.1944	0.0609	
_69_CK	0.22006	0.12896	0.12732	0.13679	-0.03334	0.21564	0.30584	-0.03937	0.13070
_69_CK	0.0014	0.0640	0.0675	0.0494	0.6334	0.0018	<.0001	0.5733	0.0605
_70_OA	0.01968	0.00701	-0.06890	0.06615	0.13045	-0.08549	-0.10938	-0.02188	0.08697
_70_OA	0.7784	0.9201	0.3239	0.3436	0.0610	0.2206	0.1167	0.7543	0.2128
_71_QL	0.14727	-0.00502	0.24078	0.14828	0.06355	0.21333	0.41965	0.04384	0.06830

_71_QL	0.0342	0.9428	0.0005	0.0330	0.3630	0.0020	<.0001	0.5305	0.3281
_72_CK	0.09682	0.11591	0.13073	0.03220	-0.08350	0.03396	0.09879	0.01069	0.05149
_72_CK	0.1652	0.0963	0.0604	0.6450	0.2316	0.6272	0.1567	0.8785	0.4612
_73_CK	0.21532	0.00792	0.09923	0.13016	0.07234	0.23286	0.21247	-0.03826	0.08287
_73_CK	0.0018	0.9098	0.1549	0.0616	0.3003	0.0007	0.0021	0.5841	0.2352
_74_SK	0.05247	-0.14430	0.05903	0.10099	0.13614	-0.07034	0.05398	-0.08579	-0.08188
_74_SK	0.4527	0.0380	0.3981	0.1477	0.0505	0.3138	0.4398	0.2191	0.2408
_75_CK	0.14067	0.00690	0.14813	0.12700	0.02208	0.28909	0.22298	0.03518	0.05894
_75_CK	0.0432	0.9214	0.0332	0.0682	0.7522	<.0001	0.0012	0.6148	0.3989
_76_IA	0.11916	-0.00043	0.22765	0.04284	-0.06058	0.34243	0.25513	0.27932	0.04095
_76_IA	0.0872	0.9951	0.0010	0.5400	0.3858	<.0001	0.0002	<.0001	0.5580
_77_OA	0.10010	0.09091	-0.09665	0.19969	0.09772	0.05219	-0.08950	0.10066	0.21786
_77_OA	0.1513	0.1927	0.1660	0.0039	0.1613	0.4551	0.1997	0.1490	0.0016
_78_OA	0.14024	-0.02134	0.11544	0.23356	0.08629	0.26097	0.27866	0.12628	0.08344
_78_OA	0.0439	0.7602	0.0976	0.0007	0.2164	0.0001	<.0001	0.0698	0.2320
_79_QL	0.24829	-0.07441	0.27357	0.27399	0.10271	0.27000	0.39545	0.06615	0.10552
_79_QL	0.0003	0.2866	<.0001	<.0001	0.1408	<.0001	<.0001	0.3436	0.1302
_80_SK	-0.09358	-0.11322	0.07923	-0.08642	0.04200	-0.15939	0.01623	-0.18967	-0.11935
_80_SK	0.1799	0.1043	0.2565	0.2157	0.5479	0.0218	0.8164	0.0062	0.0867

The SAS System 15:54 Tuesday, June 14, 2005 8

The CORR Procedure

Pearson Correlation Coefficients, N = 201
Prob > |r| under H0: Rho=0

	_69_CK	_70_OA	_71_QL	_72_CK	_73_CK	_74_SK	_75_CK	_76_IA	_77_OA
_66_QL	0.30584	-0.10938	0.41965	0.09879	0.21247	0.05398	0.22298	0.25513	-0.08950
_66_QL	<.0001	0.1167	<.0001	0.1567	0.0021	0.4398	0.0012	0.0002	0.1997
_67_IA	-0.03937	-0.02188	0.04384	0.01069	-0.03826	-0.08579	0.03518	0.27932	0.10066
_67_IA	0.5733	0.7543	0.5305	0.8785	0.5841	0.2191	0.6148	<.0001	0.1490
_68_SK	0.13070	0.08697	0.06830	0.05149	0.08287	-0.08188	0.05894	0.04095	0.21786
_68_SK	0.0605	0.2128	0.3281	0.4612	0.2352	0.2408	0.3989	0.5580	0.0016
_69_CK	1.00000	-0.00926	0.22457	0.05390	0.17904	-0.00069	0.30817	0.14448	0.05830
_69_CK		0.8947	0.0011	0.4405	0.0098	0.9921	<.0001	0.0378	0.4040
_70_OA	-0.00926	1.00000	-0.06605	-0.12340	0.03548	0.06235	0.10106	-0.06678	0.12927
_70_OA	0.8947		0.3444	0.0765	0.6118	0.3721	0.1474	0.3391	0.0634
_71_QL	0.22457	-0.06605	1.00000	0.11518	0.17449	0.16054	0.17904	0.17673	0.01911
_71_QL	0.0011	0.3444		0.0984	0.0119	0.0208	0.0098	0.0109	0.7846
_72_CK	0.05390	-0.12340	0.11518	1.00000	0.22647	-0.18612	0.17277	0.03406	0.02313

_72_CK	0.4405	0.0765	0.0984		0.0010	0.0073	0.0128	0.6261	0.7408
_73_CK	0.17904	0.03548	0.17449	0.22647	1.00000	-0.06321	0.20614	0.23083	0.08288
_73_CK	0.0098	0.6118	0.0119	0.0010		0.3656	0.0029	0.0008	0.2351
_74_SK	-0.00069	0.06235	0.16054	-0.18612	-0.06321	1.00000	-0.06533	-0.06654	-0.07367
_74_SK	0.9921	0.3721	0.0208	0.0073	0.3656		0.3497	0.3408	0.2915
_75_CK	0.30817	0.10106	0.17904	0.17277	0.20614	-0.06533	1.00000	0.20614	0.18010
_75_CK	<.0001	0.1474	0.0098	0.0128	0.0029	0.3497		0.0029	0.0094
_76_IA	0.14448	-0.06678	0.17673	0.03406	0.23083	-0.06654	0.20614	1.00000	-0.00643
_76_IA	0.0378	0.3391	0.0109	0.6261	0.0008	0.3408	0.0029		0.9268
_77_OA	0.05830	0.12927	0.01911	0.02313	0.08288	-0.07367	0.18010	-0.00643	1.00000
_77_OA	0.4040	0.0634	0.7846	0.7408	0.2351	0.2915	0.0094	0.9268	
_78_OA	0.28976	0.23083	0.15981	0.08871	0.23083	0.02000	0.22467	0.04900	0.35482
_78_OA	<.0001	0.0008	0.0214	0.2037	0.0008	0.7749	0.0010	0.4832	<.0001
_79_QL	0.35851	-0.04932	0.47041	0.11470	0.20614	0.18343	0.28058	0.13542	0.04122
_79_QL	<.0001	0.4804	<.0001	0.0998	0.0029	0.0082	<.0001	0.0517	0.5554
_80_SK	-0.03920	0.11061	-0.09868	-0.03918	0.04261	0.07588	-0.00107	-0.05164	-0.08706
_80_SK	0.5750	0.1126	0.1572	0.5752	0.5421	0.2772	0.9878	0.4599	0.2122

The CORR Procedure

Pearson Correlation Coefficients, N = 201
Prob > |r| under H0: Rho=0

	_78_OA	_79_QL	_80_SK	_81_CK	_82_IA
_66_QL	0.27866	0.39545	0.01623	-0.00775	-0.13650
_66_QL	<.0001	<.0001	0.8164	0.9117	0.0498
_67_IA	0.12628	0.06615	-0.18967	-0.15462	0.22566
_67_IA	0.0698	0.3436	0.0062	0.0261	0.0011
_68_SK	0.08344	0.10552	-0.11935	-0.15712	0.09735
_68_SK	0.2320	0.1302	0.0867	0.0238	0.1629
_69_CK	0.28976	0.35851	-0.03920	0.08171	-0.06422
_69_CK	<.0001	<.0001	0.5750	0.2418	0.3579
_70_OA	0.23083	-0.04932	0.11061	0.11233	0.05149
_70_OA	0.0008	0.4804	0.1126	0.1071	0.4612
_71_QL	0.15981	0.47041	-0.09868	0.01286	-0.06496
_71_QL	0.0214	<.0001	0.1572	0.8540	0.3524
_72_CK	0.08871	0.11470	-0.03918	-0.03422	-0.04418
_72_CK	0.2037	0.0998	0.5752	0.6245	0.5273
_73_CK	0.23083	0.20614	0.04261	0.13873	-0.00569

_73_CK	0.0008	0.0029	0.5421	0.0462	0.9351
_74_SK	0.02000	0.18343	0.07588	0.17687	-0.14616
_74_SK	0.7749	0.0082	0.2772	0.0108	0.0356
_75_CK	0.22647	0.28058	-0.00107	0.17060	-0.06260
_75_CK	0.0010	<.0001	0.9878	0.0140	0.3702
_76_IA	0.04900	0.13542	-0.05164	-0.00726	0.13018
_76_IA	0.4832	0.0517	0.4599	0.9173	0.0615
_77_OA	0.35482	0.04122	-0.08706	-0.10036	0.17547
_77_OA	<.0001	0.5554	0.2122	0.1502	0.0114
_78_OA	1.00000	0.24660	-0.04245	0.08148	-0.05606
_78_OA		0.0003	0.5436	0.2432	0.4223
_79_QL	0.24660	1.00000	0.00057	0.11356	-0.10360
_79_QL	0.0003		0.9935	0.1033	0.1374
_80_SK	-0.04245	0.00057	1.00000	0.29449	-0.20041
_80_SK	0.5436	0.9935		<.0001	0.0038

The CORR Procedure

Pearson Correlation Coefficients, N = 201
Prob > |r| under H0: Rho=0

	_51_SK	_52_CK	_53_QL	_54_OA	_55_IA	_56_CK	_57_OA	_58_IA	_59_QL
_81_CK	-0.14304	0.06433	0.06386	0.07034	-0.07862	0.23530	-0.01050	-0.07640	-0.01219
_81_CK	0.0398	0.3571	0.3607	0.3139	0.2601	0.0006	0.8806	0.2739	0.8616
_82_IA	0.15351	-0.09106	-0.08907	0.02203	0.03815	0.06194	0.00182	0.11270	0.04291
_82_IA	0.0272	0.1919	0.2018	0.7528	0.5852	0.3753	0.9793	0.1059	0.5393

Pearson Correlation Coefficients, N = 201
Prob > |r| under H0: Rho=0

	_60_SK	_61_SK	_62_IA	_63_SK	_64_CK	_65_IA	_66_QL	_67_IA	_68_SK
_81_CK	-0.06530	-0.17183	0.07198	0.02804	0.07523	-0.09822	-0.00775	-0.15462	-0.15712
_81_CK	0.3499	0.0133	0.3027	0.6884	0.2813	0.1591	0.9117	0.0261	0.0238
_82_IA	0.09389	0.13559	-0.04938	0.03295	0.00320	0.01156	-0.13650	0.22566	0.09735
_82_IA	0.1784	0.0514	0.4798	0.6375	0.9635	0.8686	0.0498	0.0011	0.1629

Pearson Correlation Coefficients, N = 201
Prob > |r| under H0: Rho=0

	_69_CK	_70_OA	_71_QL	_72_CK	_73_CK	_74_SK	_75_CK	_76_IA	_77_OA
_81_CK	0.08171	0.11233	0.01286	-0.03422	0.13873	0.17687	0.17060	-0.00726	-0.10036
_81_CK	0.2418	0.1071	0.8540	0.6245	0.0462	0.0108	0.0140	0.9173	0.1502

_82_IA	-0.06422	0.05149	-0.06496	-0.04418	-0.00569	-0.14616	-0.06260	0.13018	0.17547
_82_IA	0.3579	0.4612	0.3524	0.5273	0.9351	0.0356	0.3702	0.0615	0.0114

Pearson Correlation Coefficients, N = 201
Prob > |r| under H0: Rho=0

	_78_OA	_79_QL	_80_SK	_81_CK	_82_IA
_81_CK	0.08148	0.11356	0.29449	1.00000	-0.29621
_81_CK	0.2432	0.1033	<.0001		<.0001
_82_IA	-0.05606	-0.10360	-0.20041	-0.29621	1.00000
_82_IA	0.4223	0.1374	0.0038	<.0001	

APPENDIX E:

SAS OUTPUT OF PRINCIPAL FACTOR ANALYSIS OF SRL QUESTION ITEMS

The FACTOR Procedure

Means and Standard Deviations from 201 Observations

Variable	Mean	Std Dev
_27_IGO	4.3043478	1.2460152
_28_Expect	5.8502415	1.2313807
_29_SE	5.7391304	1.2265530
_34_Expect	5.5797101	1.3589595
_37_TP	5.0676329	1.3017038
_38_Effreg	5.5314010	1.1896518
_39_IGO	4.9806763	1.3933314
_41_SE	6.1014493	1.0586435
_43_TP	4.2028986	1.7341211
_44_Effreg	5.3671498	1.3619244
_45_IGO	3.8840580	1.4734172
_47_SE	5.7729469	1.1412999
_49_TP	5.4589372	1.5062990
_50_Effreg	5.0772947	1.3595460

The FACTOR Procedure
Initial Factor Method: Iterated Principal Factor Analysis

Prior Communality Estimates: SMC

_27_IGO	_28_Expect	_29_SE	_34_Expect	_37_TP	_38_Effreg	_39_IGO
0.22304306	0.35621183	0.67358903	0.20047758	0.49848124	0.54109327	0.44644685

_41_SE	_43_TP	_44_Effreg	_45_IGO	_47_SE	_49_TP	_50_Effreg
0.68873009	0.36211387	0.43943260	0.24719225	0.67737566	0.37222227	0.40491492

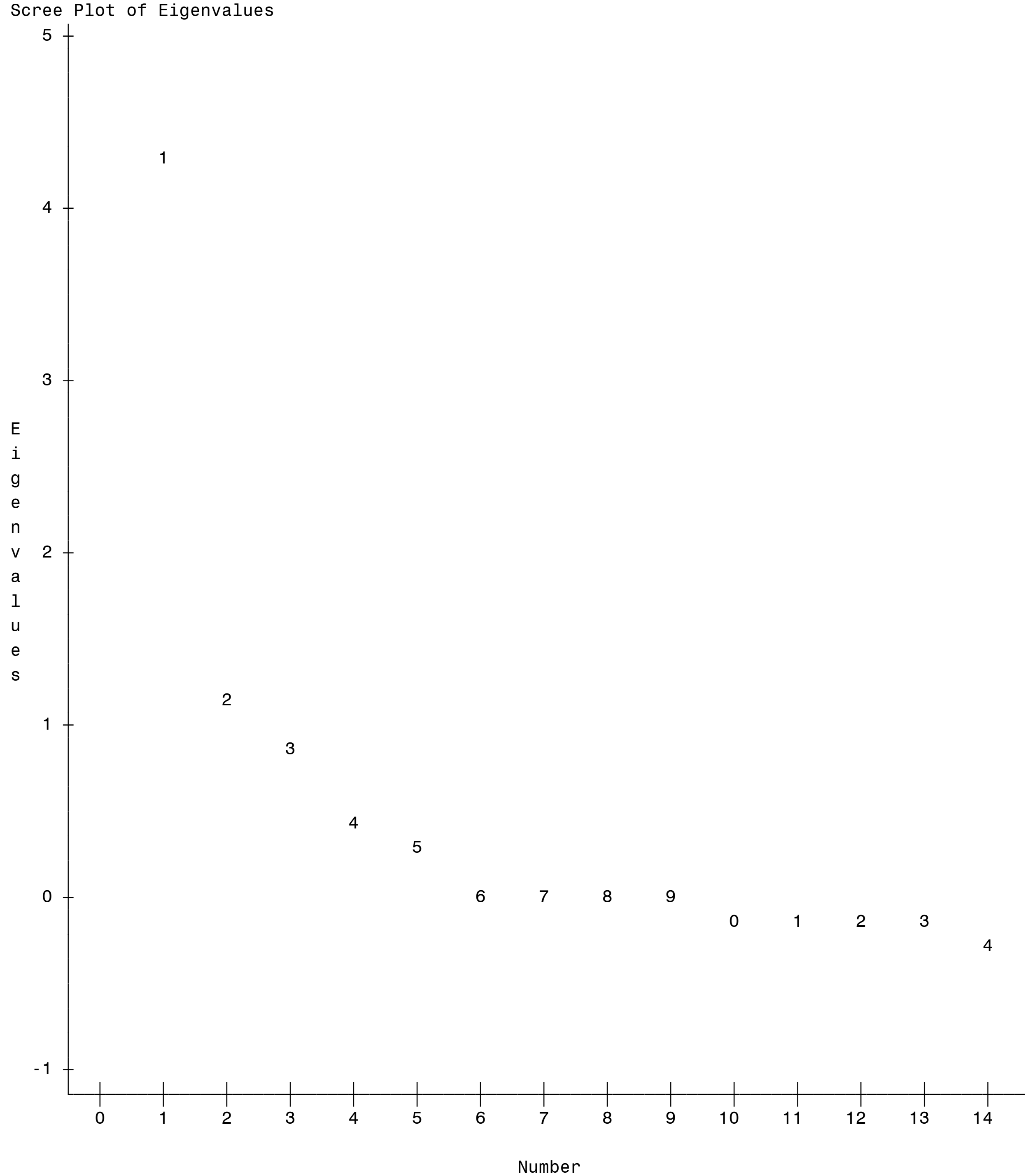
Preliminary Eigenvalues: Total = 6.13132454 Average = 0.43795175

	Eigenvalue	Difference	Proportion	Cumulative
1	4.29045121	3.08282932	0.6998	0.6998
2	1.20762189	0.31178302	0.1970	0.8967
3	0.89583887	0.49776271	0.1461	1.0428
4	0.39807616	0.14046822	0.0649	1.1078
5	0.25760794	0.21720229	0.0420	1.1498
6	0.04040565	0.03145532	0.0066	1.1564
7	0.00895033	0.01435074	0.0015	1.1578
8	-.00540041	0.05681863	-0.0009	1.1569
9	-.06221905	0.01117346	-0.0101	1.1468
10	-.07339250	0.09938812	-0.0120	1.1348
11	-.17278063	0.00194051	-0.0282	1.1066
12	-.17472114	0.02964306	-0.0285	1.0781
13	-.20436421	0.07038537	-0.0333	1.0448
14	-.27474957		-0.0448	1.0000

3 factors will be retained by the NFACTOR criterion.

The FACTOR Procedure
Initial Factor Method: Iterated Principal Factor Analysis

Scree Plot of Eigenvalues



The FACTOR Procedure
Initial Factor Method: Iterated Principal Factor Analysis

Iteration	Change	Communalities							
1	0.0804	0.22073	0.35690	0.70488	0.13407	0.51632	0.50013	0.52690	0.71120
		0.38868	0.47733	0.28757	0.72606	0.40344	0.43971		
2	0.0443	0.21739	0.35203	0.71564	0.12311	0.51715	0.48638	0.57123	0.71735
		0.39470	0.48945	0.29906	0.74591	0.41075	0.44657		
3	0.0269	0.21511	0.34925	0.71894	0.12079	0.51580	0.48192	0.59811	0.71824
		0.39566	0.49381	0.30050	0.75461	0.41229	0.44703		
4	0.0175	0.21378	0.34793	0.71970	0.11999	0.51473	0.48040	0.61556	0.71778
		0.39550	0.49560	0.29879	0.75876	0.41255	0.44629		
5	0.0119	0.21298	0.34730	0.71967	0.11961	0.51408	0.47982	0.62741	0.71717
		0.39516	0.49643	0.29644	0.76092	0.41258	0.44554		
6	0.0083	0.21248	0.34696	0.71944	0.11938	0.51370	0.47956	0.63569	0.71667
		0.39487	0.49687	0.29430	0.76212	0.41261	0.44496		
7	0.0059	0.21214	0.34675	0.71920	0.11924	0.51346	0.47941	0.64158	0.71634
		0.39464	0.49713	0.29257	0.76283	0.41264	0.44454		
8	0.0042	0.21191	0.34662	0.71900	0.11914	0.51330	0.47932	0.64582	0.71612
		0.39448	0.49729	0.29125	0.76327	0.41267	0.44425		
9	0.0031	0.21174	0.34654	0.71885	0.11907	0.51319	0.47926	0.64888	0.71598
		0.39436	0.49740	0.29027	0.76354	0.41270	0.44403		
10	0.0022	0.21162	0.34647	0.71875	0.11902	0.51312	0.47921	0.65112	0.71589
		0.39428	0.49747	0.28955	0.76372	0.41272	0.44388		
11	0.0016	0.21153	0.34643	0.71867	0.11899	0.51306	0.47918	0.65275	0.71584
		0.39421	0.49753	0.28902	0.76384	0.41274	0.44377		
12	0.0012	0.21146	0.34639	0.71861	0.11896	0.51303	0.47916	0.65394	0.71580
		0.39417	0.49756	0.28864	0.76391	0.41275	0.44369		
13	0.0009	0.21141	0.34637	0.71857	0.11894	0.51300	0.47914	0.65482	0.71578
		0.39413	0.49759	0.28835	0.76397	0.41276	0.44363		

Convergence criterion satisfied.

Eigenvalues of the Reduced Correlation Matrix: Total = 6.55807306 Average = 0.46843379

	Eigenvalue	Difference	Proportion	Cumulative
1	4.32258873	3.03823047	0.6591	0.6591
2	1.28435826	0.33284528	0.1958	0.8550
3	0.95151298	0.56856458	0.1451	1.0001
4	0.38294840	0.11730089	0.0584	1.0585
5	0.26564752	0.19071651	0.0405	1.0990
6	0.07493101	0.02306875	0.0114	1.1104
7	0.05186226	0.03505331	0.0079	1.1183
8	0.01680896	0.03558098	0.0026	1.1209
9	-.01877202	0.02250242	-0.0029	1.1180
10	-.04127444	0.08376203	-0.0063	1.1117
11	-.12503647	0.01098743	-0.0191	1.0926
12	-.13602390	0.06523770	-0.0207	1.0719

The FACTOR Procedure
Initial Factor Method: Iterated Principal Factor Analysis

Eigenvalues of the Reduced Correlation Matrix: Total = 6.55807306 Average = 0.46843379

	Eigenvalue	Difference	Proportion	Cumulative
13	-.20126160	0.06895504	-0.0307	1.0412
14	-.27021664		-0.0412	1.0000

Factor Pattern

		Factor1	Factor2	Factor3
_27_IGO	_27_IGO	31	29	18
_28_Expect	_28_Expect	56 *	-3	17
_29_SE	_29_SE	71 *	-44 *	17
_34_Expect	_34_Expect	31	-4	16
_37_TP	_37_TP	65 *	24	-17
_38_Effreg	_38_Effreg	67 *	15	-5
_39_IGO	_39_IGO	44 *	58 *	36
_41_SE	_41_SE	73 *	-37	21
_43_TP	_43_TP	43 *	12	-44 *
_44_Effreg	_44_Effreg	60 *	10	-35
_45_IGO	_45_IGO	13	37	36
_47_SE	_47_SE	74 *	-42 *	18
_49_TP	_49_TP	52 *	-4	-37
_50_Effreg	_50_Effreg	57 *	33	-11

Printed values are multiplied by 100 and rounded to the nearest integer. Values greater than 0.4 are flagged by an '*'.

Variance Explained by Each Factor

Factor1	Factor2	Factor3
4.3225887	1.2843583	0.9515130

Final Communality Estimates: Total = 6.558460

_27_IGO	_28_Expect	_29_SE	_34_Expect	_37_TP	_38_Effreg	_39_IGO
0.21141215	0.34636908	0.71856918	0.11894325	0.51299683	0.47913807	0.65481766

_41_SE	_43_TP	_44_Effreg	_45_IGO	_47_SE	_49_TP	_50_Effreg
0.71578079	0.39412975	0.49758887	0.28835394	0.76396627	0.41276124	0.44363290

The FACTOR Procedure
Prerotation Method: Varimax

Orthogonal Transformation Matrix

	1	2	3
1	0.70246	0.63069	0.32983
2	-0.59323	0.26279	0.76093
3	0.39324	-0.73019	0.55874

Rotated Factor Pattern

		Factor1	Factor2	Factor3
_27_IGO	_27_IGO	11	14	42 *
_28_Expect	_28_Expect	48 *	22	26
_29_SE	_29_SE	82 *	21	-1
_34_Expect	_34_Expect	30	7	16
_37_TP	_37_TP	24	60 *	30
_38_Effreg	_38_Effreg	37	50 *	30
_39_IGO	_39_IGO	11	17	78 *
_41_SE	_41_SE	82 *	21	7
_43_TP	_43_TP	6	63 *	-1
_44_Effreg	_44_Effreg	22	66 *	8
_45_IGO	_45_IGO	1	-8	53 *
_47_SE	_47_SE	84 *	23	3
_49_TP	_49_TP	25	59 *	-7
_50_Effreg	_50_Effreg	16	52 *	38

Printed values are multiplied by 100 and rounded to the nearest integer. Values greater than 0.4 are flagged by an '*'.

Variance Explained by Each Factor

Factor1	Factor2	Factor3
2.7320860	2.3154015	1.5109725

Final Communality Estimates: Total = 6.558460

_27_IGO	_28_Expect	_29_SE	_34_Expect	_37_TP	_38_Effreg	_39_IGO
0.21141215	0.34636908	0.71856918	0.11894325	0.51299683	0.47913807	0.65481766

_41_SE	_43_TP	_44_Effreg	_45_IGO	_47_SE	_49_TP	_50_Effreg
0.71578079	0.39412975	0.49758887	0.28835394	0.76396627	0.41276124	0.44363290

The FACTOR Procedure
Rotation Method: Promax (power = 3)

Target Matrix for Procrustean Transformation

Factor1 Factor2 Factor3

_27_IGO	_27_IGO	2	3	81 *
_28_Expect	_28_Expect	60 *	5	9
_29_SE	_29_SE	100 *	2	0
_34_Expect	_34_Expect	70 *	1	11
_37_TP	_37_TP	4	60 *	8
_38_Effreg	_38_Effreg	17	38	9
_39_IGO	_39_IGO	0	1	95 *
_41_SE	_41_SE	99 *	2	0
_43_TP	_43_TP	0	100 *	0
_44_Effreg	_44_Effreg	4	85 *	0
_45_IGO	_45_IGO	0	0	100 *
_47_SE	_47_SE	99 *	2	0
_49_TP	_49_TP	6	78 *	0
_50_Effreg	_50_Effreg	2	50 *	19

Printed values are multiplied by 100 and rounded to the nearest integer. Values greater than 0.4 are flagged by an '*'.

Procrustean Transformation Matrix

	1	2	3
1	1.33411118	-0.3483563	-0.0516027
2	-0.3695101	1.35963824	-0.2298206
3	-0.0806206	-0.2035035	1.31557315

Normalized Oblique Transformation Matrix

	1	2	3
1	0.57346487	0.47232409	0.20344052
2	-0.804001	0.35410305	0.78187607
3	0.63429726	-1.0763212	0.71047242

Inter-Factor Correlations

	Factor1	Factor2	Factor3
Factor1	100 *	52 *	23

Printed values are multiplied by 100 and
rounded to the nearest integer. Values greater

The FACTOR Procedure
Rotation Method: Promax (power = 3)

than 0.4 arInter-Factor Correlations

	Factor1	Factor2	Factor3
Factor2	52 *	100 *	37
Factor3	23	37	100 *

Printed values are multiplied by 100 and
rounded to the nearest integer. Values greater
than 0.4 are flagged by an '*'.

Rotated Factor Pattern (Standardized Regression Coefficients)

		Factor1	Factor2	Factor3
_27_IGO	_27_IGO	5	6	42 *
_28_Expect	_28_Expect	46 *	7	21
_29_SE	_29_SE	86 *	0	-8
_34_Expect	_34_Expect	30	-4	15
_37_TP	_37_TP	7	58 *	20
_38_Effreg	_38_Effreg	24	42 *	22
_39_IGO	_39_IGO	1	3	80 *
_41_SE	_41_SE	85 *	-1	1
_43_TP	_43_TP	-13	72 *	-13
_44_Effreg	_44_Effreg	4	70 *	-5
_45_IGO	_45_IGO	0	-20	58 *
_47_SE	_47_SE	88 *	1	-5
_49_TP	_49_TP	10	63 *	-19
_50_Effreg	_50_Effreg	0	50 *	29

Printed values are multiplied by 100 and rounded to the nearest
integer. Values greater than 0.4 are flagged by an '*'.

Reference Axis Correlations

	Factor1	Factor2	Factor3
Factor1	100 *	-48 *	-5
Factor2	-48 *	100 *	-30
Factor3	-5	-30	100 *

Printed values are multiplied by 100 and
rounded to the nearest integer. Values greater
than 0.4 are flagged by an '*'.

The FACTOR Procedure
Rotation Method: Promax (power = 3)

Reference Structure (Semipartial Correlations)

		Factor1	Factor2	Factor3
_27_IGO	_27_IGO	5	4	39
_28_Expect	_28_Expect	39	6	20
_29_SE	_29_SE	73 *	0	-7
_34_Expect	_34_Expect	26	-3	14
_37_TP	_37_TP	6	47 *	18
_38_Effreg	_38_Effreg	20	35	20
_39_IGO	_39_IGO	1	2	74 *

_41_SE	_41_SE	73 *	-1	0
_43_TP	_43_TP	-11	59 *	-12
_44_Effreg	_44_Effreg	4	57 *	-5
_45_IGO	_45_IGO	0	-16	54 *
_47_SE	_47_SE	75 *	1	-5
_49_TP	_49_TP	8	51 *	-18
_50_Effreg	_50_Effreg	0	41 *	27

Printed values are multiplied by 100 and rounded to the nearest integer. Values greater than 0.4 are flagged by an '*'.

Variance Explained by Each Factor Eliminating Other Factors

Factor1	Factor2	Factor3
1.9124331	1.4782660	1.2478445

Factor Structure (Correlations)

		Factor1	Factor2	Factor3
_27_IGO	_27_IGO	18	24	45 *
_28_Expect	_28_Expect	54 *	38	34
_29_SE	_29_SE	84 *	42 *	12
_34_Expect	_34_Expect	32	18	20
_37_TP	_37_TP	42 *	69 *	43 *
_38_Effreg	_38_Effreg	51 *	63 *	43 *
_39_IGO	_39_IGO	21	32	81 *
_41_SE	_41_SE	85 *	43 *	20
_43_TP	_43_TP	21	60 *	10
_44_Effreg	_44_Effreg	39	70 *	21
_45_IGO	_45_IGO	3	2	51 *
_47_SE	_47_SE	87 *	45 *	15

Printed values are multiplied by 100 and rounded to the nearest integer. Values greater than 0.4 are flagged by an '*'.

The FACTOR Procedure
Rotation Method: Promax (power = 3)

Factor Structure (Correlations)

		Factor1	Factor2	Factor3
_49_TP	_49_TP	38	61 *	6
_50_Effreg	_50_Effreg	32	61 *	48 *

Printed values are multiplied by 100 and rounded to the nearest integer. Values greater than 0.4 are flagged by an '*'.

Variance Explained by Each Factor Ignoring Other Factors

Factor1	Factor2	Factor3
3.5480271	3.3810239	1.9974185

Final Communality Estimates: Total = 6.558460

_27_IGO	_28_Expect	_29_SE	_34_Expect	_37_TP	_38_Effreg	_39_IGO
0.21141215	0.34636908	0.71856918	0.11894325	0.51299683	0.47913807	0.65481766
_41_SE	_43_TP	_44_Effreg	_45_IGO	_47_SE	_49_TP	_50_Effreg
0.71578079	0.39412975	0.49758887	0.28835394	0.76396627	0.41276124	0.44363290

APPENDIX F:

SAS OUTPUT OF PRINCIPAL FACTOR ANALYSIS OF EB QUESTION ITEMS

The FACTOR Procedure

Means and Standard Deviations from 201 Observations

Variable	Mean	Std Dev
_54_OA	3.9613527	0.9545263
_55_IA	2.2318841	1.1296308
_58_IA	2.9806763	1.2731787
_60_SK	3.2850242	1.0524672
_63_SK	3.0483092	1.0369787
_65_IA	2.2560386	1.0226321
_66_QL	1.5942029	0.8182181
_67_IA	3.2028986	1.1179868
_68_SK	3.1449275	0.9286491
_71_QL	1.5265700	0.7808505
_76_IA	2.3671498	1.0194626
_77_OA	3.8454106	0.9270821
_78_OA	2.5120773	0.9796963
_79_QL	1.7777778	0.8751637

The FACTOR Procedure
Initial Factor Method: Iterated Principal Factor Analysis

Prior Communality Estimates: SMC

_54_OA	_55_IA	_58_IA	_60_SK	_63_SK	_65_IA	_66_QL
0.12836503	0.37394587	0.21400723	0.27425910	0.32598381	0.41648500	0.47379791

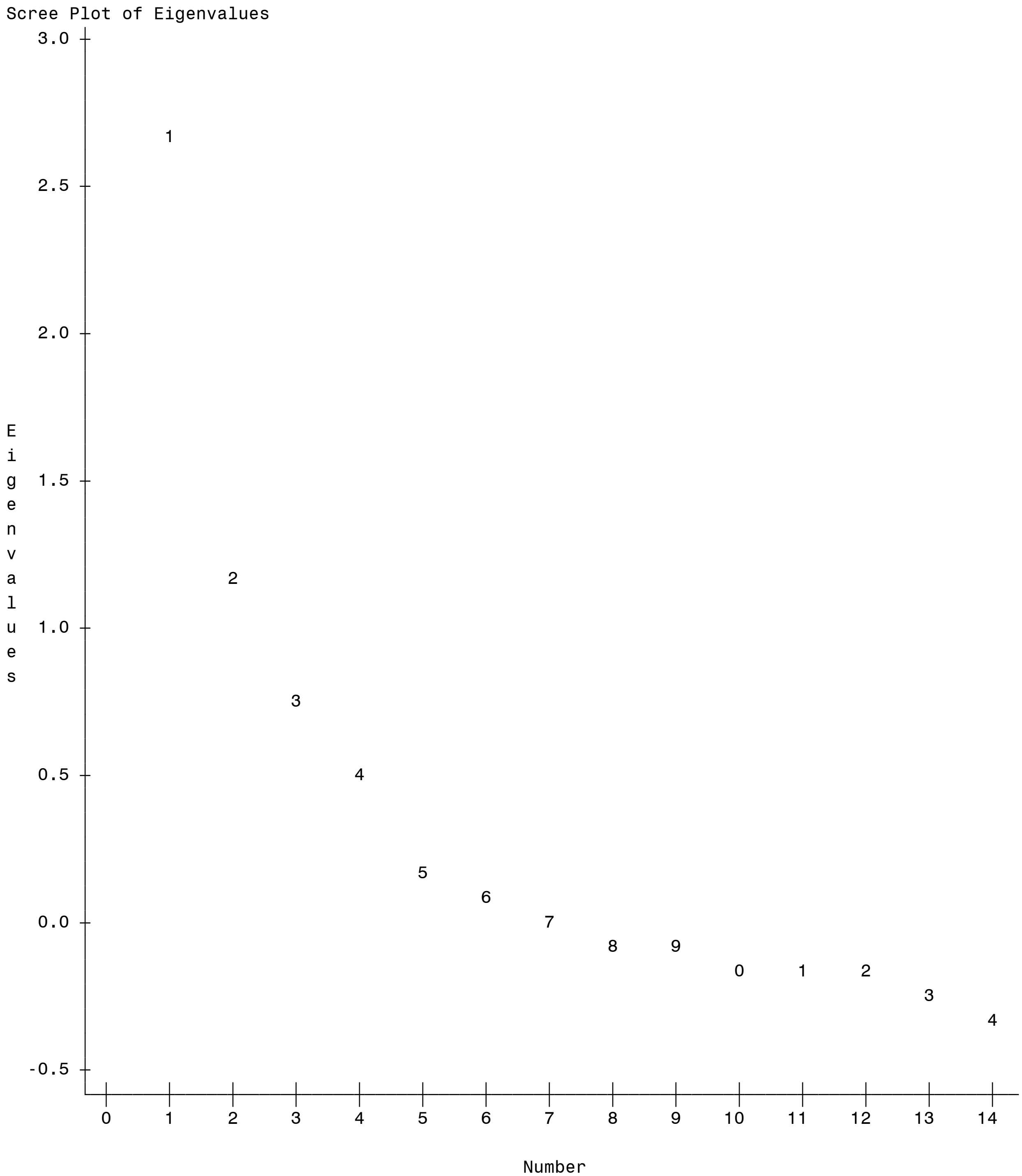
_67_IA	_68_SK	_71_QL	_76_IA	_77_OA	_78_OA	_79_QL
0.28463717	0.15938541	0.30007974	0.25323461	0.23236627	0.31813498	0.32710232

Preliminary Eigenvalues: Total = 4.08178445 Average = 0.29155603

	Eigenvalue	Difference	Proportion	Cumulative
1	2.65741091	1.48396572	0.6510	0.6510
2	1.17344519	0.42669974	0.2875	0.9385
3	0.74674545	0.22961874	0.1829	1.1215
4	0.51712670	0.36625847	0.1267	1.2482
5	0.15086823	0.04469884	0.0370	1.2851
6	0.10616939	0.13096058	0.0260	1.3111
7	-.02479118	0.06067436	-0.0061	1.3051
8	-.08546554	0.01988781	-0.0209	1.2841
9	-.10535335	0.06066302	-0.0258	1.2583
10	-.16601637	0.00259517	-0.0407	1.2176
11	-.16861154	0.02749709	-0.0413	1.1763
12	-.19610863	0.03032266	-0.0480	1.1283
13	-.22643128	0.07077226	-0.0555	1.0728
14	-.29720354		-0.0728	1.0000

4 factors will be retained by the NFACTOR criterion.

The FACTOR Procedure
Initial Factor Method: Iterated Principal Factor Analysis



The FACTOR Procedure
Initial Factor Method: Iterated Principal Factor Analysis

Iteration	Change	Communalities							
1	0.1110	0.18677	0.46188	0.26896	0.34756	0.43695	0.48611	0.55065	0.36337
		0.18182	0.36838	0.30238	0.30512	0.41894	0.41583		
2	0.0545	0.19504	0.49071	0.27645	0.37338	0.49142	0.50303	0.57649	0.38625
		0.17600	0.38746	0.30708	0.32757	0.46843	0.44540		
3	0.0312	0.19228	0.50150	0.27552	0.38157	0.52263	0.50536	0.58566	0.39369
		0.16920	0.39207	0.30564	0.33341	0.49741	0.45557		
4	0.0199	0.18847	0.50607	0.27411	0.38264	0.54251	0.50412	0.58905	0.39645
		0.16507	0.39272	0.30443	0.33349	0.51676	0.45899		
5	0.0140	0.18550	0.50821	0.27328	0.38092	0.55612	0.50243	0.59031	0.39760
		0.16284	0.39249	0.30387	0.33163	0.53079	0.46001		
6	0.0107	0.18341	0.50929	0.27289	0.37831	0.56592	0.50102	0.59073	0.39815
		0.16164	0.39222	0.30368	0.32924	0.54147	0.46017		
7	0.0084	0.18191	0.50987	0.27274	0.37565	0.57324	0.49997	0.59081	0.39843
		0.16095	0.39210	0.30363	0.32689	0.54984	0.46004		
8	0.0067	0.18082	0.51019	0.27270	0.37327	0.57883	0.49921	0.59073	0.39860
		0.16054	0.39209	0.30364	0.32480	0.55652	0.45985		
9	0.0054	0.17998	0.51037	0.27270	0.37127	0.58316	0.49865	0.59059	0.39869
		0.16026	0.39216	0.30366	0.32301	0.56193	0.45965		
10	0.0044	0.17932	0.51049	0.27272	0.36963	0.58656	0.49822	0.59044	0.39876
		0.16006	0.39226	0.30369	0.32150	0.56634	0.45949		
11	0.0036	0.17879	0.51056	0.27274	0.36832	0.58924	0.49790	0.59028	0.39880
		0.15992	0.39238	0.30371	0.32026	0.56996	0.45935		
12	0.0030	0.17836	0.51060	0.27276	0.36727	0.59136	0.49764	0.59013	0.39884
		0.15981	0.39250	0.30373	0.31923	0.57294	0.45924		
13	0.0025	0.17800	0.51063	0.27278	0.36643	0.59305	0.49743	0.59000	0.39886
		0.15972	0.39261	0.30375	0.31839	0.57541	0.45915		
14	0.0020	0.17771	0.51065	0.27280	0.36577	0.59439	0.49727	0.58989	0.39888
		0.15965	0.39271	0.30376	0.31769	0.57745	0.45908		
15	0.0017	0.17746	0.51066	0.27281	0.36524	0.59545	0.49713	0.58979	0.39890
		0.15960	0.39279	0.30377	0.31712	0.57915	0.45902		
16	0.0014	0.17726	0.51066	0.27282	0.36482	0.59630	0.49702	0.58971	0.39891
		0.15956	0.39286	0.30378	0.31665	0.58056	0.45898		
17	0.0012	0.17709	0.51067	0.27283	0.36448	0.59698	0.49693	0.58964	0.39892
		0.15953	0.39293	0.30379	0.31626	0.58174	0.45894		
18	0.0010	0.17695	0.51067	0.27284	0.36421	0.59752	0.49685	0.58958	0.39893
		0.15950	0.39298	0.30379	0.31594	0.58272	0.45891		

Convergence criterion satisfied.

Eigenvalues of the Reduced Correlation Matrix: Total = 5.62071936 Average = 0.40147995

	Eigenvalue	Difference	Proportion	Cumulative
1	2.77540099	1.46041021	0.4938	0.4938
2	1.31499077	0.46360649	0.2340	0.7277

The FACTOR Procedure
Initial Factor Method: Iterated Principal Factor Analysis

Eigenvalues of the Reduced Correlation Matrix: Total = 5.62071936 Average = 0.40147995

	Eigenvalue	Difference	Proportion	Cumulative
3	0.85138428	0.17176420	0.1515	0.8792
4	0.67962008	0.44843579	0.1209	1.0001
5	0.23118429	0.04001724	0.0411	1.0413
6	0.19116706	0.13059984	0.0340	1.0753
7	0.06056721	0.05622846	0.0108	1.0860
8	0.00433875	0.00398178	0.0008	1.0868
9	0.00035697	0.02964422	0.0001	1.0869
10	-.02928724	0.03042285	-0.0052	1.0817
11	-.05971009	0.02725953	-0.0106	1.0710
12	-.08696962	0.02365696	-0.0155	1.0556
13	-.11062658	0.09107092	-0.0197	1.0359
14	-.20169750		-0.0359	1.0000

Factor Pattern

		Factor1	Factor2	Factor3	Factor4
_54_OA	_54_OA	0	35	6	22
_55_IA	_55_IA	55 *	-41 *	19	-9
_58_IA	_58_IA	39	-18	29	7
_60_SK	_60_SK	40 *	27	15	-33
_63_SK	_63_SK	43 *	50 *	18	-37
_65_IA	_65_IA	64 *	-19	-2	22
_66_QL	_66_QL	66 *	-16	-35	7
_67_IA	_67_IA	48 *	-18	36	8
_68_SK	_68_SK	21	27	15	-15
_71_QL	_71_QL	45 *	6	-42 *	-10
_76_IA	_76_IA	45 *	-28	14	4
_77_OA	_77_OA	15	43 *	24	24
_78_OA	_78_OA	40	46 *	-7	46 *
_79_QL	_79_QL	52 *	17	-37	-13

Printed values are multiplied by 100 and rounded to the nearest integer. Values greater than 0.4 are flagged by an '*'.

Variance Explained by Each Factor

Factor1	Factor2	Factor3	Factor4
2.7754010	1.3149908	0.8513843	0.6796201

The FACTOR Procedure
Initial Factor Method: Iterated Principal Factor Analysis

Final Communality Estimates: Total = 5.621396

_54_OA	_55_IA	_58_IA	_60_SK	_63_SK	_65_IA	_66_QL
0.17695272	0.51067254	0.27283631	0.36421020	0.59751984	0.49685300	0.58957962

_67_IA	_68_SK	_71_QL	_76_IA	_77_OA	_78_OA	_79_QL
0.39893039	0.15950097	0.39297627	0.30379395	0.31593620	0.58272021	0.45891391

The FACTOR Procedure
Prerotation Method: Varimax

Orthogonal Transformation Matrix

	1	2	3	4
1	0.68177	0.61068	0.36482	0.17081
2	-0.50356	0.04582	0.55512	0.66043
3	0.49231	-0.79027	0.33210	0.15105
4	0.19813	-0.02124	-0.66967	0.71543

Rotated Factor Pattern

		Factor1	Factor2	Factor3	Factor4
_54_OA	_54_OA	-10	-4	7	40 *
_55_IA	_55_IA	65 *	17	9	-22
_58_IA	_58_IA	51 *	0	9	4
_60_SK	_60_SK	15	15	56 *	3
_63_SK	_63_SK	6	15	74 *	17
_65_IA	_65_IA	57 *	39	-2	14
_66_QL	_66_QL	37	67 *	-1	1
_67_IA	_67_IA	61 *	0	14	7
_68_SK	_68_SK	5	3	37	13
_71_QL	_71_QL	5	61 *	12	-2
_76_IA	_76_IA	52 *	15	3	-6
_77_OA	_77_OA	5	-8	21	51 *
_78_OA	_78_OA	10	31	7	69 *
_79_QL	_79_QL	6	62 *	25	5

Printed values are multiplied by 100 and rounded to the nearest integer. Values greater than 0.4 are flagged by an '*'.

Variance Explained by Each Factor

Factor1	Factor2	Factor3	Factor4
1.8564949	1.5697973	1.1732897	1.0218142

Final Communality Estimates: Total = 5.621396

_54_OA	_55_IA	_58_IA	_60_SK	_63_SK	_65_IA	_66_QL
0.17695272	0.51067254	0.27283631	0.36421020	0.59751984	0.49685300	0.58957962

The FACTOR Procedure
Prerotation Method: Varimax

_67_IA	_68_SK	_71_QL	_76_IA	_77_OA	_78_OA	_79_QL
0.39893039	0.15950097	0.39297627	0.30379395	0.31593620	0.58272021	0.45891391

The FACTOR Procedure
Rotation Method: Promax (power = 3)

Target Matrix for Procrustean Transformation

		Factor1	Factor2	Factor3	Factor4
_54_OA	_54_OA	-1	0	0	100 *
_55_IA	_55_IA	81 *	1	0	-3
_58_IA	_58_IA	100 *	0	1	0
_60_SK	_60_SK	2	2	94 *	0
_63_SK	_63_SK	0	1	100 *	1
_65_IA	_65_IA	55 *	19	0	1
_66_QL	_66_QL	12	71 *	0	0
_67_IA	_67_IA	97 *	0	1	0
_68_SK	_68_SK	0	0	95 *	4
_71_QL	_71_QL	0	100 *	1	0
_76_IA	_76_IA	91 *	2	0	0
_77_OA	_77_OA	0	0	6	87 *
_78_OA	_78_OA	0	7	0	85 *
_79_QL	_79_QL	0	84 *	6	0

Printed values are multiplied by 100 and rounded to the nearest integer. Values greater than 0.4 are flagged by an '*'.

Procrustean Transformation Matrix

	1	2	3	4
1	1.50410443	-0.2513718	-0.1066061	0.03932538
2	-0.3724705	1.25612964	-0.1316759	-0.0822516
3	-0.051969	-0.0565251	1.55175594	-0.1717266
4	-0.0169768	-0.143605	-0.1862872	1.49100824

Normalized Oblique Transformation Matrix

	1	2	3	4
1	0.55813063	0.48563332	0.25427164	0.11768955
2	-0.585743	0.05108889	0.52431865	0.60433009

3	0.72991479	-1.02046	0.35938683	0.17628065
4	0.23628451	-0.1247036	-0.7942878	0.83148715

The FACTOR Procedure
Rotation Method: Promax (power = 3)

Inter-Factor Correlations

	Factor1	Factor2	Factor3	Factor4
Factor1	100 *	44 *	15	8
Factor2	44 *	100 *	19	21
Factor3	15	19	100 *	26
Factor4	8	21	26	100 *

Printed values are multiplied by 100 and rounded to the nearest integer. Values greater than 0.4 are flagged by an '*'.

Rotated Factor Pattern (Standardized Regression Coefficients)

		Factor1	Factor2	Factor3	Factor4
_54_OA	_54_OA	-10	-7	3	41 *
_55_IA	_55_IA	66 *	7	6	-23
_58_IA	_58_IA	55 *	-13	6	5
_60_SK	_60_SK	10	10	56 *	-4
_63_SK	_63_SK	-1	9	73 *	8
_65_IA	_65_IA	51 *	29	-12	14
_66_QL	_66_QL	23	66 *	-10	-2
_67_IA	_67_IA	66 *	-15	9	7
_68_SK	_68_SK	3	-2	37	9
_71_QL	_71_QL	-12	67 *	7	-7
_76_IA	_76_IA	53 *	6	-1	-6
_77_OA	_77_OA	6	-18	16	51 *
_78_OA	_78_OA	1	23	-4	69 *
_79_QL	_79_QL	-11	66 *	19	-1

Printed values are multiplied by 100 and rounded to the nearest integer. Values greater than 0.4 are flagged by an '*'.

Reference Axis Correlations

	Factor1	Factor2	Factor3	Factor4
Factor1	100 *	-42 *	-8	3
Factor2	-42 *	100 *	-10	-16
Factor3	-8	-10	100 *	-23
Factor4	3	-16	-23	100 *

Printed values are multiplied by 100 and rounded to the

nearest integer. Values greater than 0.4 are flagged by an
'*'.

The FACTOR Procedure
Rotation Method: Promax (power = 3)

Reference Structure (Semipartial Correlations)

		Factor1	Factor2	Factor3	Factor4
_54_OA	_54_OA	-9	-7	3	39
_55_IA	_55_IA	59 *	6	6	-22
_58_IA	_58_IA	49 *	-11	5	4
_60_SK	_60_SK	9	9	53 *	-4
_63_SK	_63_SK	0	8	69 *	7
_65_IA	_65_IA	46 *	26	-11	13
_66_QL	_66_QL	20	58 *	-9	-2
_67_IA	_67_IA	59 *	-13	9	7
_68_SK	_68_SK	3	-2	35	8
_71_QL	_71_QL	-10	58 *	6	-7
_76_IA	_76_IA	47 *	5	-1	-6
_77_OA	_77_OA	5	-15	15	49 *
_78_OA	_78_OA	1	20	-4	66 *
_79_QL	_79_QL	-10	58 *	18	-1

Printed values are multiplied by 100 and rounded to the nearest
integer. Values greater than 0.4 are flagged by an '*'.

Variance Explained by Each Factor Eliminating Other Factors

Factor1	Factor2	Factor3	Factor4
1.4537130	1.2005580	0.9818668	0.9214811

Factor Structure (Correlations)

		Factor1	Factor2	Factor3	Factor4
_54_OA	_54_OA	-10	-3	11	39
_55_IA	_55_IA	68 *	32	11	-15
_58_IA	_58_IA	51 *	13	12	8
_60_SK	_60_SK	22	24	58 *	13
_63_SK	_63_SK	15	24	76 *	28
_65_IA	_65_IA	63 *	52 *	5	21
_66_QL	_66_QL	50 *	74 *	6	11
_67_IA	_67_IA	61 *	17	18	12
_68_SK	_68_SK	9	8	39	18
_71_QL	_71_QL	18	61 *	16	8
_76_IA	_76_IA	55 *	28	6	-1
_77_OA	_77_OA	5	-1	27	52 *

Printed values are multiplied by 100 and rounded to the nearest
integer. Values greater than 0.4 are flagged by an '*'.

The FACTOR Procedure
Rotation Method: Promax (power = 3)

Factor Structure (Correlations)

		Factor1	Factor2	Factor3	Factor4
_78_OA	_78_OA	16	37	18	73 *
_79_QL	_79_QL	20	65 *	30	16

Printed values are multiplied by 100 and rounded to the nearest integer. Values greater than 0.4 are flagged by an '*'.

Variance Explained by Each Factor Ignoring Other Factors

Factor1	Factor2	Factor3	Factor4
2.2209629	2.0883877	1.3681045	1.2193059

Final Communality Estimates: Total = 5.621396

_54_OA	_55_IA	_58_IA	_60_SK	_63_SK	_65_IA	_66_QL
0.17695272	0.51067254	0.27283631	0.36421020	0.59751984	0.49685300	0.58957962

_67_IA	_68_SK	_71_QL	_76_IA	_77_OA	_78_OA	_79_QL
0.39893039	0.15950097	0.39297627	0.30379395	0.31593620	0.58272021	0.45891391

APPENDIX G:

SAS OUTPUT OF CORRELATION MATRIX OF VARIABLES IN THE STUDY MODEL

The CORR Procedure

11 Variables: FinGr GPA_Exp GPA Comp_SE IGO_sum TPEffreg_sum ExpSE_sum QL_sum IA_sum OA_sum SK_sum

Simple Statistics

Variable	N	Mean	Std Dev	Sum	Minimum	Maximum	Label
FinGr	201	86.36318	13.30761	17359	0	100.00000	FinGr
GPA_Exp	201	71.07851	20.56052	14287	13.20000	112.00000	GPA_Exp
GPA	201	3.00831	0.63406	604.67000	1.00000	4.00000	GPA
Comp_SE	201	6.38308	1.18216	1283	3.00000	8.00000	Comp_SE
IGO_sum	201	13.11443	3.11317	2636	4.00000	21.00000	IGO_sum
TPEffreg_sum	201	30.83085	6.01924	6197	14.00000	42.00000	TPEffreg_sum
ExpSE_sum	201	23.49751	3.88217	4723	5.00000	28.00000	ExpSE_sum
QL_sum	201	4.88060	1.89886	981.00000	3.00000	12.00000	QL_sum
IA_sum	201	13.10448	3.81759	2634	5.00000	24.00000	IA_sum
OA_sum	201	10.35821	2.05208	2082	4.00000	15.00000	OA_sum
SK_sum	201	9.48756	2.26077	1907	3.00000	15.00000	SK_sum

Pearson Correlation Coefficients, N = 201
Prob > |r| under H0: Rho=0

	FinGr	GPA_Exp	GPA	Comp_SE	IGO_sum	TPEffreg_ sum
FinGr	1.00000	0.51891	0.39797	-0.08676	0.10303	0.32448
FinGr		<.0001	<.0001	0.2207	0.1456	<.0001
GPA_Exp	0.51891	1.00000	0.83808	-0.12825	0.14768	0.45534
GPA_Exp	<.0001		<.0001	0.0696	0.0364	<.0001
GPA	0.39797	0.83808	1.00000	-0.25281	0.03399	0.25220
GPA	<.0001	<.0001		0.0003	0.6319	0.0003
Comp_SE	-0.08676	-0.12825	-0.25281	1.00000	0.07090	0.09558
Comp_SE	0.2207	0.0696	0.0003		0.3172	0.1771
IGO_sum	0.10303	0.14768	0.03399	0.07090	1.00000	0.28360
IGO_sum	0.1456	0.0364	0.6319	0.3172		<.0001
TPEffreg_sum	0.32448	0.45534	0.25220	0.09558	0.28360	1.00000
TPEffreg_sum	<.0001	<.0001	0.0003	0.1771	<.0001	
ExpSE_sum	0.45146	0.66271	0.15953	0.09554	0.22611	0.49618
ExpSE_sum	<.0001	<.0001	0.0237	0.1773	0.0012	<.0001
QL_sum	-0.16409	-0.35450	-0.23099	-0.08866	-0.08057	-0.42961
QL_sum	0.0199	<.0001	0.0010	0.2107	0.2556	<.0001

The CORR Procedure

Pearson Correlation Coefficients, N = 201
Prob > |r| under H0: Rho=0

	FinGr	GPA_Exp	GPA	Comp_SE	IGO_sum	TPEffreg_sum
IA_sum	-0.00666	-0.03314	0.05101	-0.03772	-0.18949	-0.22182
IA_sum	0.9253	0.6405	0.4720	0.5950	0.0071	0.0016
OA_sum	0.05106	-0.00619	-0.05998	-0.05685	0.03268	0.17859
OA_sum	0.4716	0.9305	0.3977	0.4228	0.6451	0.0112
SK_sum	-0.03101	-0.08055	-0.02244	-0.02346	-0.15289	-0.25368
SK_sum	0.6621	0.2557	0.7518	0.7409	0.0302	0.0003

Pearson Correlation Coefficients, N = 201
Prob > |r| under H0: Rho=0

	ExpSE_sum	QL_sum	IA_sum	OA_sum	SK_sum
FinGr	0.45146	-0.16409	-0.00666	0.05106	-0.03101
FinGr	<.0001	0.0199	0.9253	0.4716	0.6621
GPA_Exp	0.66271	-0.35450	-0.03314	-0.00619	-0.08055
GPA_Exp	<.0001	<.0001	0.6405	0.9305	0.2557
GPA	0.15953	-0.23099	0.05101	-0.05998	-0.02244
GPA	0.0237	0.0010	0.4720	0.3977	0.7518
Comp_SE	0.09554	-0.08866	-0.03772	-0.05685	-0.02346
Comp_SE	0.1773	0.2107	0.5950	0.4228	0.7409
IGO_sum	0.22611	-0.08057	-0.18949	0.03268	-0.15289
IGO_sum	0.0012	0.2556	0.0071	0.6451	0.0302
TPEffreg_sum	0.49618	-0.42961	-0.22182	0.17859	-0.25368
TPEffreg_sum	<.0001	<.0001	0.0016	0.0112	0.0003
ExpSE_sum	1.00000	-0.34324	-0.11722	0.07982	-0.11494
ExpSE_sum		<.0001	0.0975	0.2600	0.1042
QL_sum	-0.34324	1.00000	0.35626	0.09187	0.26055
QL_sum	<.0001		<.0001	0.1946	0.0002
IA_sum	-0.11722	0.35626	1.00000	0.03605	0.21247
IA_sum	0.0975	<.0001		0.6114	0.0025
OA_sum	0.07982	0.09187	0.03605	1.00000	0.24561
OA_sum	0.2600	0.1946	0.6114		0.0004

The CORR Procedure

Pearson Correlation Coefficients, N = 201
Prob > |r| under H0: Rho=0

	ExpSE_ sum	QL_sum	IA_sum	OA_sum	SK_sum
SK_sum	-0.11494	0.26055	0.21247	0.24561	1.00000
SK_sum	0.1042	0.0002	0.0025	0.0004	

APPPENDIX H:

SAS OUTPUT OF REGRESSION OF FINAL COURSE GRADE WITH LINEAR COMBINATION OF STUDY'S INDEPENDENT VARIABLES

The REG Procedure
Model: MODEL1
Dependent Variable: FinGr FinGr

Number of Observations Read	201
Number of Observations Used	201

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	11	13813	1255.72426	10.98	<.0001
Error	189	21606	114.31492		
Corrected Total	200	35418			

Root MSE	10.69182	R-Square	0.3900
Dependent Mean	86.36318	Adj R-Sq	0.3545
Coeff Var	12.38006		

Parameter Estimates

Variable	Label	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Standardized Estimate
Intercept	Intercept	1	-80.93199	27.82328	-2.91	0.0041	0
GPA	GPA	1	45.23284	9.08382	4.98	<.0001	2.15517
ExpSE_sum	ExpSE_sum	1	5.84062	1.08159	5.40	<.0001	1.70386
GPA_Exp	GPA_Exp	1	-1.56293	0.36523	-4.28	<.0001	-2.41476
IGO_sum	IGO_sum	1	-0.09862	0.26093	-0.38	0.7059	-0.02307
TPEffreg_sum	TPEffreg_sum	1	0.16482	0.16826	0.98	0.3286	0.07455
QL_sum	QL_sum	1	0.66965	0.49298	1.36	0.1760	0.09555
IA_sum	IA_sum	1	-0.09883	0.22221	-0.44	0.6570	-0.02835
OA_sum	OA_sum	1	0.01822	0.40272	0.05	0.9640	0.00281
SK_sum	SK_sum	1	0.09330	0.37187	0.25	0.8022	0.01585
Comp_SE	Comp_SE	1	-0.10854	0.68655	-0.16	0.8745	-0.00964
reason_ol	reason_ol	1	-2.24189	1.53150	-1.46	0.1449	-0.08436