**Students' Characteristics, Self-Regulated Learning, Technology Self-Efficacy, and Course Outcomes in Web-Based Courses**

by

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## Abstract

The purpose of this study was to examine the relationship among students' characteristics, self-regulated learning, technology self-efficacy, and course outcomes in online learning settings. Previous research provided conflicting evidence regarding the relationship among these variables. Further, there is no prior research that has examined these variables simultaneously. In addition, there has been limited research examining self-regulated learning as the mediator between students' characteristics and course outcomes. Therefore, a hypothesized model was generated based on previous empirical studies.

Two hundred and fifty-six students participated in this study. All participants completed an online survey hosted via SuveryMonkey.com. The survey consisted of a total of 130 items with a demographic questionnaire, the Modified Motivation Strategies Learning Questionnaire, the Open-ended Learning Strategies Questionnaire, the Online Technology Self-Efficacy Scale, the Course Satisfaction Questionnaire, and the final grades. Structural Equation Modeling was served as the major data analysis method.

The results indicated that the initially hypothesized was not an appropriate model in terms of explaining the relationship among students' characteristics, self-regulated learning, technology self-efficacy, and course outcomes. After model re-specification, a final model with good fit was obtained. Based on the results from the final model, the number of previous online courses taken directly influenced the effectiveness of students'

learning strategies in taking online courses, and then, directly affected the students' levels of motivation. Students' levels of motivation influenced their levels of technology self-efficacy and course satisfaction. Finally, their levels of technology self-efficacy and course satisfaction affected their final grades. In other words, students with previous online learning experiences tended to have more effective learning strategies when taking online courses, and hence, had higher levels of motivation in their online courses. When students had higher levels of motivation in their online courses, their levels of technology self-efficacy increased, and their levels of course satisfaction also increased. As their levels of technology self-efficacy and course satisfaction increased, their final grade tended to be better than the students who did not have experiences in taking online courses.

In order to understand the specific learning strategies students used in taking online courses, four open-ended questions which were modified from Self-Regulated Learning Interview Schedule (Zimmerman & Martinez-Pons, 1986) were used. The results indicated that students used planners/calendars, and reviewing Blackboard and syllabus in order to keep up with the assignments. Most of the students took notes in terms of remembering the learning materials and some reviewed the stream videos. In addition, in order to review the learning materials, students downloaded the files posted on the Blackboard and made hard copies to have everything handed. While taking online courses, students used search engine, Blackboard, and online library a lot in order to obtain more information. They also reported that the e-mails and discussion board were very useful in terms of interacting with the instructors and their classmates.

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# I. INTRODUCTION

With the improvement of web-based technology, online learning has become an increasing educational trend (Arbaugh, 2000; Jung & Rha, 2000; Arbaugh & Duray, 2002; Kim, 2004; Lim, Yoon & Morris, 2006). Online learning is very different from traditional learning (see Table 1). In online learning settings, students do not have to be physically present a regular classroom. They do not have a chance to discuss their learning materials nor do their learning activities face-to-face with their instructors and classmates. However, they can decide when, where and how long to access the learning materials. They are responsible for their own learning (McMahon, & Oliver, 2001).

Table 1
The Difference between the Traditional Classroom Learning Settings and Online Learning Settings

| | Traditional | Online |
|---|---|---|
| Settings | Classroom | Web / computers |
| Place | Schools or institutions | Home / any place |
| Time | Scheduled | Anytime |
| Audience | Based on the level of students | Flexible, usually adult learners |
| Instruction | Face-to-face | Hardly face-to-face |
| Feedback from Instructors | Instant | Not exactly instant |
| Assessment | Pencil and Paper | Online |

Based on the National Center for Education Statistics, during 2000-2001 academic year, 55 percent of 2-year and 4-year institutions provided distance education courses at college, graduate, and professional levels. Ninety percent of distance courses were offered online. There were 2,876,000 students enrolled in the distance courses (Waits, Lewis & Greene, 2003). In the 2006-2007 academic year, 66 percent of 2-year and 4-year institutions offered distance education courses, and 92.4 percent of the distance courses were offered online. There were 12.2 million students enrolled in the distance courses (Parsad, Lewis & Tice, 2008). The growing number of online courses makes the course and learning quality an important concern.

Lim et al. (2006) asserted that course outcomes can be an index for evaluating the overall quality of distance learning programs. Course outcomes include both cognitive and affective variables (Paechter, Maier & Macher, 2010). Among the cognitive variables, learning achievement is the most important one, whereas course satisfaction is the important affective variable (Lim et a. 2006; Paechter et al., 2010). A course is successful when students feel satisfied with their learning experience (Marks, Sibley & Arbaugh, 2005). Students' satisfaction with the online courses is also correlated with the probability of persistence and dropouts in online learning (Arbaugh, 2000; Billings, 2000; Levy, 2007; Thurmond, Wambach, Connor& Frey, 2002). Furthermore, course satisfaction is the key component which leads students to success in learning (Biner, Dean & Mellinger, 1994; American Psychological Association, 1997; Chang & Smith, 2008; Mark et al., 2005). When students are more satisfied in their online course, they tend to earn higher grades (Puzziferro, 2008).

Motivation is correlated with the course satisfaction and achievement (Lim et al., 2006). In addition, it is also a significant factor in predicting the performance in online learning settings (Sankaran & Bui, 2001; Lim et at., 2006). Self-regulated learning is very important in taking online courses because of the special characteristics of online learning settings (Wijekumar, Ferguson & Wagoner, 2006). Whipp and Chiarelli (2004), and Yukselturk and Bulut (2007) found that students used self-regulated learning strategies in their web-based courses based on the interview results. Researchers also have found that self-regulated learning has a positive correlation with students' performance and satisfaction with online courses (Artino & McCoach, 2008; Paechter et al., 2010; Puzziferro, 2008). Pintrich and Zusho (2002) have defined self-regulated learning as an active and constructive process. It involves the students' active, goal-directed, self-control of behaviors, motivation, and cognition for academic tasks (Pintrich, 1995). Students set goals for their learning, and use many cognitive and metacognitive strategies to monitor, control, regulate and adjust their learning to reach these goals (Pintrich, 1995; Pintrich, 1999; Pinch & Zusho, 2002). Pintrich (2004) also pointed that self-regulatory activities are mediators between personal and contextual characteristics and actual achievement or performance.

Based on Zimmerman's model of self-regulation, self-efficacy is a key competence belief in self-regulatory control processes, such as goal setting and strategy selection (Pintrich & Schunk, 1996; Schunk & Zimmerman, 2006). The concept of self-efficacy was introduced by Bandura (1977a). He defined perceived self-efficacy as personal judgments of one's capabilities to organize and execute courses of action to attain designated goals. In other words, self-efficacy indicated the beliefs of the

capabilities of what one can do in a specific domain. Self-efficacy has an effect on task choice, effort, persistence and achievement. It also influences academic motivations, learning, and achievement (Schunk, & Pajares, 2002). From this point of view, students with positive self-efficacy about the online courses in which they enroll usually have more motivation and better performance in these courses.

In addition to the self-efficacy in the specific online course, the skills of using online learning technologies are also important for students who enroll in online courses. These skills, including the use of E-mails, Internet search engines, chat rooms, and databases are the major computer skills required in online courses. Students who fear computer technologies may experience confusion, anxiety, a loss of personal control, frustration, and withdrawal (Bates, & Khasawneh, 2004). However, previous researchers have found conflicting results regarding the relationship between technology self-efficacy and students' performance and satisfaction with online courses.

DeTure (2004) and Puzziferro (2008) indicated that the technology self-efficacy was a poor predictor of the course final grade and satisfaction in online courses. On the other hand, some researchers reported that technology self-efficacy is positively correlated with online learning performance (Joo, Bong & Choi, 2000; Wang & Newlin, 2002). In addition, Bates and Khasawneh (2004) found that both the training provided by instructors and the previous success experience with online learning technologies can reduce the anxiety of online learning technologies, as well as increase online learning technologies self-efficacy. Furthermore, online learning technologies self-efficacy will influence the motivation to use online learning technologies.

Some researchers have tried to establish the relationship between students' characteristics and previous online learning experience, and their satisfaction and performance in online learning settings (Marks et al., 2005; Sanders & Morrison-Shetlar, 2001; Thurmond et al., 2002). However, they found these variables cannot consistently predict students' performance and satisfaction toward their online learning experiences. While Thurmond et al. (2002) found that the number of online courses the students have taken is positively correlated with their course satisfaction, the study failed to reach statistical significance as a predictor. Sanders and Morrison-Shetlar (2002) found that the females have more positive attitudes toward web-based courses than males. They also found that younger students (<20 years old) have more positive attitudes in online courses than older students (> 23 years old) do. On the other hand, Marks et al. (2005), Yukselturk and Bulut (2007), and Yukselturk (2009) reported that age, gender, educational level, and previous number of online courses taken are not significant predictors in predicting the current online course satisfaction or students' achievement.

The results in investigating the relationship between students' characteristics and motivation, and technology self-efficacy are not consistent. Busch (1995) and Imhof, Vollmeyer, and Beierlein (2007) found that there are no gender differences in college students in terms of their perceived self-efficacy in using computers. Yukselturk and Bulut (2009) reported that there is no gender difference in self-efficacy, self-regulated learning, nor achievement. On the other hand, Brown, Boyer, Mayall, Johnson, Meng, Butler, Weir, Florea, Hernandez, and Reis (2003) found that males have more technology self-efficacy than females. They also found that the females have more academic self-efficacy than males. As for the previous online learning experience, Lim et al. (2006)

reported that there is a significant difference in learning motivation and self-efficacy between students with previous distance learning experience and those without previous distance learning experience, while Bates and Khasawneh (2004) indicated that previous success online learning experiences increase technology self-efficacy.

In summary, researchers have provided conflicting evidence regarding the relationship among students' characteristics and previous experience in online learning, self-regulated learning and technology self-efficacy, and course satisfaction and performance. In addition, there is no prior research that has examined these variables simultaneously. Moreover, the data analysis techniques in previous researches were relied on ordinary least squares solution, such as ANOVA and regression, in which the results obtained were not stable because of large variance (Goldberger, 1971, Tibshirani, 1996). Therefore, the current study generated a hypothesized model (Figure 1) based on previous empirical studies, and determined the relationship among these variables via structural equation modeling (SEM) to eliminate the problems associated with ordinary least squares analysis.

In Figure 1, students' characteristics include gender, educational level, and the numbers of previous online courses the students have taken, while course outcomes include final grade and course satisfaction. Students' characteristics influence the level of self-regulated learning and the level of technology self-efficacy, and these two factors then affect the level of course outcomes. In addition, self-regulated learning and technology self-efficacy interact to each other, and they are both mediators between students' characteristics and course outcomes.

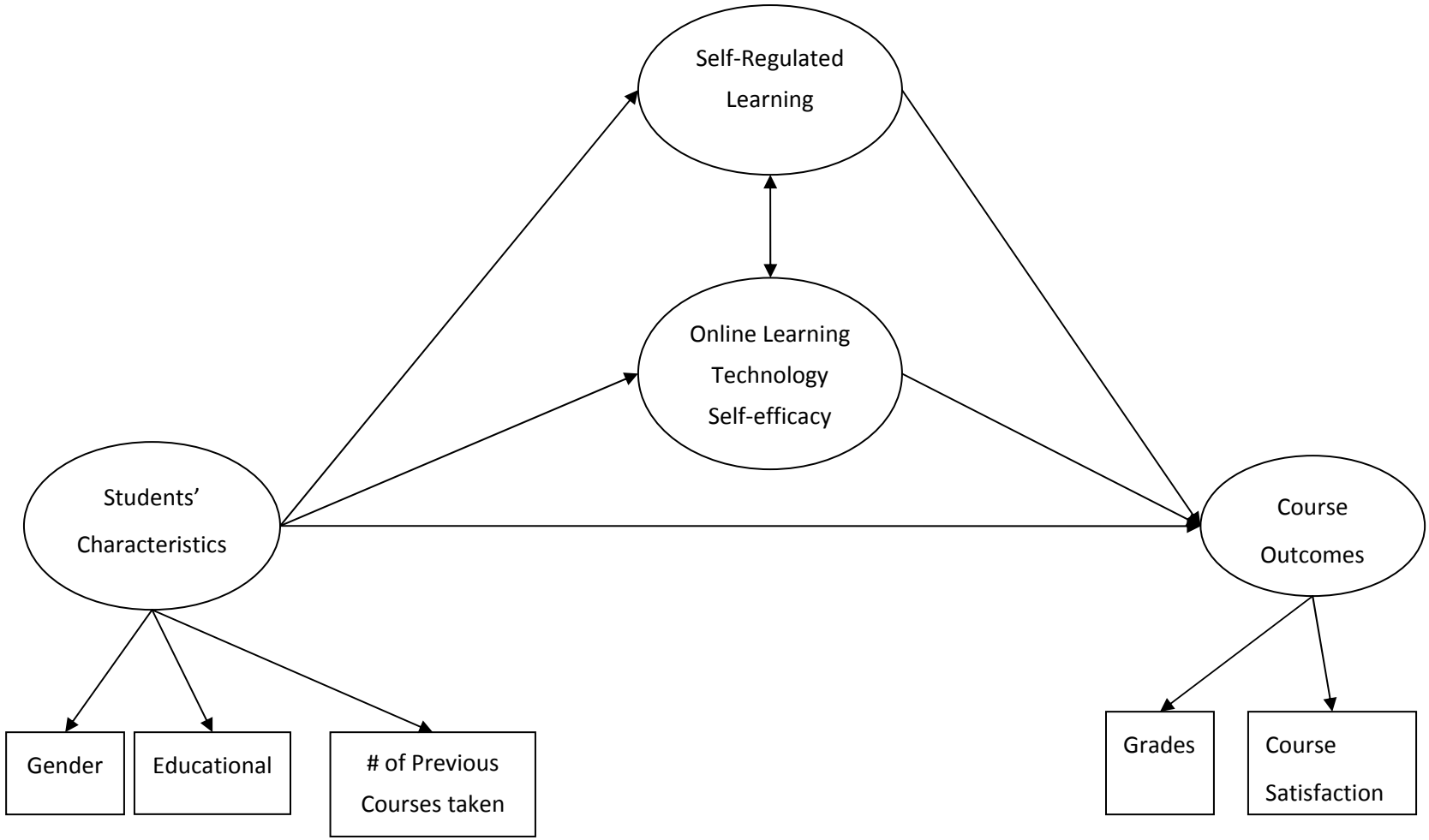


Figure 1. Hypothesized Model

## Statement of Problem

The current study focused on the relationship among students' characteristics, previous online learning experiences, self-regulated learning, technology self-efficacy, and course outcomes (achievement and satisfaction).

Researchers have found positive relationships between self-regulated learning and course outcomes (Artino & McCoach, 2008; Puzziferro, 2008), while results pertaining to the relationship between technology self-efficacy and course outcomes has been mixed. Some researchers have revealed a positive relationship between self-efficacy and course outcomes (Joo, Bong & Choi, 2000; Wang & Newlin, 2002), while others have found that technology self-efficacy was not statistically significant in relation to course outcomes (DeTure, 2004; Puzziferro, 2008). In addition, students' characteristics and previous online learning experience have been linked with self-regulated learning and technology self-efficacy with mixed results (Bates & Khasawneh, 2004; Brown et al., 2003; Busch, 1995; Imhof et al., 2007; Lim et al., 2006; Yukselturk & Bulut, 2009). All these variables, however, have been investigated separately with very little research examining these variables together. Furthermore, the data analysis methods used in previous research consisted of correlation, ANOVA, and regression, which are limited in their examination of these variables and are subject to estimation bias.

Therefore, in order to examine the extent to which students' characteristics and previous online learning experiences, self-regulated learning, and technology self-efficacy work together and their influence on online learning achievement and satisfaction, the current study investigated the relationship among these variables using SEM data analysis technique.

## Purpose of Study

The purpose of current study is to determine the relationship among students' characteristics and previous experience in online learning, self-regulated learning (motivation and learning strategies), technology self-efficacy, and the course outcomes (course performance and course satisfaction). Based on previous studies, a hypothesis model was generated in Figure 1. Overall, the current study seeks to determine if the hypothesis model can explain the relationship among student characteristics, self-regulated learning, technology self-efficacy, and distance course outcomes.

## Research Questions and Hypotheses

The research questions of current study are:

(1) Overall, can the hypothesized model explain the relationship among students' characteristics and previous experience in online learning, self-regulated learning (motivation and learning strategies), technology self-efficacy, and course outcome (achievement and course satisfaction) in online learning settings?

(2) Do students' characteristics and previous experience in online learning influence self-regulated learning, technology self-efficacy, and course outcomes (achievement, and satisfaction) in online learning settings?

(3) A. Does students' self-regulated learning influence the course outcome in online learning settings?

B. Does students' technology self-efficacy influence the course outcome in online learning settings?

C. Does students' technology self-efficacy influence their self-regulated learning?

(4) Are self-regulated learning and technology self-efficacy mediators between students' characteristics and previous experience in online learning, and the course outcome?

The following null hypotheses were tested in current study:

(1) Overall, the hypothesis model cannot explain the relationship among students' characteristics and previous experience in online learning, self-regulated learning (motivation and learning strategies), technology self-efficacy, and course outcome (achievement and course satisfaction) in online learning settings.

(2) Students' characteristics and previous experience in online learning do not influence their self-regulated learning, technology self-efficacy, course outcome in online learning settings.

(3) A. Students' self-regulated learning does not influence their course outcome in online learning settings.

B. Students' technology self-efficacy does not influence their self-regulated learning and the course outcome in online learning settings.

C. Students' technology self-efficacy does not influence their self-regulated learning.

(4) Self-regulated learning and technology self-efficacy are not mediators between students' characteristics and previous experience in online learning, and the course outcome.

## Significance of the Study

An understanding of the roles that student characteristics, self-regulated learning, and technology self-efficacy play in students satisfaction with and performance in online courses has implications for course designs, instructors, and researchers. The course designers and instructors can gain some insight to improve students' online learning achievement and satisfaction, which can improve of the quality of the online learning courses. Also, future researchers can use a basic model to explain the relationship among these variables, and furthermore, extend the model to help courses designers and instructors improve the quality of online courses.

If self-regulated learning enhances the students' online learning achievement and satisfaction, then online courses should be designed and taught to encourage students' self-regulated learning, including cognitive and metacognitive strategies to monitor, control, regulate, and adjust their learning and thus reach their learning goals. In addition, if technology self-efficacy affects the students' online learning achievement and satisfaction, then instructors should help students to develop their confidence in using technology so they can succeed in the course.

Likewise, if students' characteristics and previous online learning experience influence self-regulated learning and technology self-efficacy, and further influence students' online learning achievement and satisfaction, then course designers and instructors can understand the importance of helping students who do not have previous experience in online learning or those whose characteristics do not fit the online learning to success in their online courses.

## Limitations

1. A non-experimental quantitative research designed with self-report survey measures will be used in this study. The reason is that the participants cannot be randomly assigned to different levels of motivation, self-efficacy, and different types of learning strategies. Therefore, the results should be interpreted with caution when generalizing them to other populations.
2. In current study, participants are going to be selected by cluster sampling method from the students at Auburn University who enrolled in online courses during Fall, 2008 to Fall, 2009. Therefore, they are not randomly chosen and may be different from other students in other colleges and universities. Hence, generalization of results may be limited.
3. All instruments used in this study are self-report measures. Self-report measures relied on participants' ability and willingness to report accurately. In addition, the participants may respond the questions based on social desirability or response acquiescence.
4. Each participant was asked to complete an over 100-item questionnaire with seven measurement subscales. To control for potential order effects, a Latin Square design was used in presenting these tools in different orders. The assumption of the Latin Square design is that the treatment effect, row effect, and column effect are independent to each other (Freund & Wilson, 2003). In other words, there are no interactions among the order of the instrument, the type of forms, and the contents of the instruments. Since every part of instrument appears in each position once, the position effect is controlled (Kirt, 1995; Maxwell &

Delaney, 2004). The final forms of the questionnaire with their orders and the SAS code used to generate the Latin Square are shown in Chapter 3.

5. The research questionnaires were delivered via university E-mail system. There are possibilities that the potential participants ignore or do not check their E-mails, the survey is identified as junk, or E-mail address is incorrect. Therefore, a friendly notice was sent to the participants by E-mail a week before the formal survey, and two friendly reminders were sent to them a week and two weeks after the participants received the formal survey. In order to recruit a large enough sample, all students who enrolled in online courses during Fall, 2008 to Fall, 2009 were included as potential participants.

## Assumptions

1. Course satisfaction, performance, self-regulated learning, technology self-efficacy, students' characteristics and previous experience in online learning variables in this study are constructs. Constructs cannot be observed directly and difficult to measure. Therefore, an assumption was made that, these constructs do exist, and the measures used to measure these constructs are appropriate.
2. An assumption was made that, all participants in this study are able to read and comprehend all the survey questions accurately.
3. An assumption was made that, all participants in this study respond to all the survey questions as honestly and accurately as possible.

## Definitions

Terms as they are used in this study are defined as follows:

1. "Web-based courses", also called online courses, is defined as an educational method which the students are physically separated from the instructors and the institutions, and the course delivery option is using online platforms, such as Blackboard and WebCT (Scholesser & Anderson, 1994; Bourne, 1998).
2. The term "Course Outcomes" in this study includes course satisfaction and achievement in two dimensions.
   (1) "Course satisfaction" refers to students' overall perceptions with online courses experiences and the value perceived from the courses (Frey, Yankelov & Faul, 2003; Bolliger & Martindale, 2004).
   (2) "Performance" refers to the final grade students earned in the most current online courses.
3. The antecedent variables in the current study include demographic information (gender and educational level: undergraduate or graduate student) and the number of courses the participants have taken in the past.
4. "Self-regulated learning" involves the active, goal-directed, self-control of behaviors, motivation, and cognition for academic tasks by students (Pintrich, 1995). Students set goals for their learning, and use many cognitive and metacognitive strategies to monitor, control, regulate and adjust their learning to reach these goals (Pintrich, 1995; Pintrich, 1999; Pinch & Zusho, 2002). In addition, cognitive, metacognitive, resource management, and affective activities

are the strategies that are usually used in self-regulated learning (Pintrich, 1999; Cho, 2004).

5. "Self-efficacy" was defined as the personal judgments of one's capabilities to organize and execute courses of action to attain designated goals. In other words, self-efficacy indicated the beliefs of the capabilities of what one can do in a specific domain. Self-efficacy has an effect on task choice, effort, persistence and achievement (Schunk, & Pajares, 2002).
6. "Technology self-efficacy" refers to students' self-efficacy beliefs with online technologies (Miltiadou & Yu, 2000).

## Organizational Overview

Following this chapter, this study is organized as follows: Chapter Two introduces a review of related literature. Chapter Three discusses the methodology employed in the study including the research's purpose, design, instrumentation, and subjects. Chapter Four is comprised of a summary and description of the results from data analysis, and Chapter Five consists of the summary, discussion of findings, conclusions, and recommendations.

# II. LITERATURE REVIEW

Chapter I provided an overview of current study. The purpose of the study, statement of the problem, research questions, significance of the study, limitations, and the definition of the terms were also presented. This chapter is going to provide the reviews of the previous research. A brief introduction to online learning, course outcome as the dependent variable, self-regulated learning theories, the measures of self-regulated learning, relationship between self-regulated learning and course outcomes, technology self-efficacy and its relationship with course outcomes are going to be presented. Also, the relationship between course outcomes and students' characteristics will be discussed. Finally, the differences between moderator and mediator will be discussed.

## Introduction

Distance education is defined as an educational method which the students are physically separated from the instructors and the institutions (Scholesser & Anderson, 1994). Because of the separation, there are many course delivery options. As early as the 1800's, correspondence courses were used as the course delivery method in distance education. In the 1920's, distance courses were delivered via radio, and starting from the early1930's, they were delivered as television programs. In 1993, Graziadie first

introduced an online computer-delivered lecture and provided computer programs which allowed students and the instructors to use computers as virtual classroom settings. This was considered to be the beginning of online learning and web-based courses were starting to be considered as one of course delivery options in distance education. Technology, such as web browsing, discussion boards, e-mails, video streams…etc, is a key component in online learning settings. Online courses can be categorized as asynchronous and synchronous. In an asynchronous online learning sitting, students do not have to be in front of the computer at a particular time. They use e-mails, thread conferencing systems, online discussion boards, and/or video streams as online interaction methods. In synchronous online learning settings, some or all students have to be online at the same time, and they all participate in online chat sessions, virtual classroom meetings, or video conferences. Online course management systems, such as Blackboard and WebCT, provide platforms for instructors to design and organize online courses as well as for students to manage their online learning (Bourne, 1998).

## Course Outcomes

With the improvement of web-based technology, online learning has become an increasing educational trend (Arbaugh, 2000; Jung & Rha, 2000; Arbaugh & Duray, 2002; Kim, 2004; Lim et al., 2006). Frick, Chadha, Watson, Wang, and Green (2009) pointed at that a course is an instructional product. Therefore, with the increasing number of web-based courses offered in the market, how to choose effective and satisfactory online courses has become an important issue (Mark et al., 2005). Kirkpatrick and Kirkpatrick (1994) stated that four levels of evaluation can be applied to a training program: (1)

learner's satisfaction, (2) learning, (3) transfer the learning to the learner's job, and (4) overall impact on the learner's organization. These criteria have been widely used in non-formal educational settings (Frick et al., 2009). Frick et al. used the first two criteria, satisfaction and performance, as the indices for evaluating the overall teaching and learning quality in college courses. They found that students' satisfaction and perceived learning were strongly correlated with the global course ratings.

Similarly, Lim et al. (2006) also recommended that course outcomes can be an index for evaluating the overall quality of distance learning programs. Course outcomes include both cognitive and affective variables (Paechter et al., 2010). Among the cognitive variables, learning achievement is the most important one, whereas course satisfaction is the important affective variable (Lim et a. 2006; Paechter et al., 2010).

Previous research suggested that students' satisfaction toward the online courses was correlated with the probability of persistence and dropouts in online learning (Arbaugh, 2000; Billings, 2000; Levy, 2007; Thurmond et al., 2002). It is also a key component which leads students to success in learning (Biner, Dean & Mellinger, 1994; American Psychological Association, 1997; Chang & Smith, 2008; Mark et al., 2005). When students are more satisfied in their online course, they tend to earn higher grades (Puzziferro, 2008).

## Self-Regulated Learning

Motivation is correlated with the course satisfaction and achievement (Lim et al., 2006). It is also considered as one of the best determining factors of academic success ( Yukselturk & Bulut, 2007). In addition, it is also a significant factor in predicting the

performance in online learning settings (Sankaran & Bui, 2001; Lim et at., 2006). Sankaran and Bui (2001) compared the relationship between students' motivation, learning strategy and performance in Web-based and lecture courses. They developed a Learning Strategy and Motivation Survey as their measure. One hundred and sixteen undergraduate students who enrolled in a business computer course participated in this study. Forty-six students were enrolled in the Web format, and 70 of them took the course via traditional format. A series of t-test were used to compare the test scores by motivation levels (deep learning, surface learning, and undirected learning), and by motivation levels (low, moderate, and high motivation). Their results indicated that there were no performance differences in different learning strategies between the students who took web course and those who took traditional course. However, the relationship between students' motivation levels and performance was stronger in web-based courses than in lecture courses, with statistically significant positive results. In addition, they also found that the higher motivation led to greater learning gains. Lim et al. (2006) examined the relationships between course outcomes and students' learning motivation in an online learning setting. The stepwise regression results indicated that learning motivation was a statistically significant factor in predicting course satisfaction and perceived learning. While students' learning motivation increased, the level of satisfaction and perceived learning also increased.

Wijekumar, Ferguson, and Wagoner (2006) compared the differences between traditional classroom and web-based learning environments. They suggested that self-regulatory skills for working in a distance learning environment are very important for students because of the special characteristics of online learning environment, such as

students being isolated from other students, delayed feedback from instructors…etc.

Yukselturk and Bulut (2007) analyzed different factors and their relationship with success in online learning settings. These factors included demographic variables (gender, age, and educational level), learning style, locus of control, motivational beliefs (such as intrinsic/extrinsic goal orientations, control beliefs, task value, self-efficacy, and test anxiety), and self-regulated learning components (such as cognitive strategy use, self-regulation). They examined 80 volunteer students in two online courses, and found that only self-regulation can statistically significantly predict students' success in online learning settings. They also interviewed the instructors in order to understand the instructors' view regarding students' success in online learning settings. The instructors reported that students who took responsibility and those who were more self-disciplined and active in their learning are more likely to be successful in their online courses.

Whipp and Chiarelli (2004) interviewed six graduate students to determine if they adopted any self-regulated learning strategies when they took online courses. They analyzed the interview transcripts, students' reflective journals, course documents, and student Web pages. By applying Zimmerman's three-phase cyclical model of self-regulated learning, they found that these students used many self-regulated learning strategies when taking online courses. They also modified the self-regulated learning strategies that were used in traditional classes into a method in which they can be applied in the web-based courses.

Winters, Greene and Costich (2008) analyzed 33 empirical and peer-reviewed articles which were focused on examining the relationship between self-regulated learning and academic learning in computer-based learning environments. They

concluded that students adapted self-regulated learning strategies in taking online courses. In addition, students demonstrating high achievement or more learning gain tended to use more self-regulated learning strategies than those who exhibited lower achievement and less learning gain.

*Self-Regulated Learning Theories*

Zimmerman (1990) pointed out three features of self-regulated learning: (a) self-regulation processes and the strategies are applied to optimize these processes; (b) it is a "self-oriented feedback" loop; and (c) learning and motivation are interdependent motivational processes. Based on these features, Pintrich in 2000 defined "self-regulated learning is an active, constructive process whereby learners set goals for their learning and then attempt to monitor, regulate, and control their cognition, motivation, and behavior in the service of those goals, guided and constrained by both personal characteristics and the contextual features in the environment" (Printrich & Zusho, 2002, pp. 250). In other words, self-regulated students are metacognitively, motivationally, and behaviorally active participants in their own learning process to reach their learning goals (Zimmerman, 2001).

Self-regulated learning theories assume that students can personally improve their ability to learn through selective use of metacognitive and motivational strategies. They also can proactively select, structure, and even create advantageous learning environments. In addition, self-regulated learners can play a significant role in choosing the form and amount of instruction they need (Zimmerman, 2001). Zimmerman developed a conceptual framework for the dimensions of self-regulation (Table 2). He

pointed out that the critical element in self-regulation is that learners have some choices in their learning issues. When all the requirements/rules in the learning tasks are well described, students cannot self-regulate by doing these tasks. On the other hand, if one or more of the learning rules are not specified, there is more potential that students will self-regulate.

Table 2

Dimensions of Self-Regulation (adapted from Schunk, Pintrich & Meece, 2007, pp. 154)

| Learning Issues | Self-Regulation Subprocesses |
|---|---|
| Why | Self-efficacy and self-goals |
| How | Strategy use or routinized performance |
| When | Time management |
| What | Self-observation, self-judgment, self-reaction |
| Where | Environmental structuring |
| With Whom | Selective help seeking |

*Zimmerman's Three-Phase Model*

Zimmerman's self-regulated learning model is based on social cognitive theory. Social cognitive theory posits that the person, behavior, and environment are factors which interact with each other, and as such, self-regulated learning is a cyclical process. When one of these three factors changes during learning, the changes will be monitored, and leads to the changes in the other factors (Schunk et al., 2008). For example, when the learning environment changes from a traditional learning setting to an online learning

setting, students' learning strategies, cognitions, affects, and behaviors will be changed in order to adjust the change in the environment.

Based on this concept, Zimmerman introduced a three-phase self-regulation model that acts in a cyclical manner (Alderman, 2004; Schunk, Pintrich & Meece, 2008). The three phases are forethought-planning, which precedes learning and sets the stages; performances or volitional control, processes occurances during learning to help the learner stay on the task; and reflection, which evaluates a task that cycles back and influences forethought (Figure 2). Based on the model, Alderman (2004) stated that self-regulated learners have a belief that effort will lead to increased success (forethought), have a strong sense of self-efficacy (forethought), have tools for setting effective goals and monitoring progress (performance), and have adaptive attributional beliefs, accepting responsibility for their learning (evaluation).

In Zimmerman's model, self-efficacy is a key competence belief in self-regulatory control processes, such as goal setting and strategy selection (Schunk & Zimmerman, 2006). During the forethought phase, learners assess their self-efficacy for learning. They set goals and plans based on their self-efficacy beliefs. During the performance/volitional control phase, they monitor their performance and adjust strategies as needed in order to reach the optimized performance. Therefore, strategies, such as highlighting, taking notes, outlining are used during this phase. Finally, during the reflection phase, they evaluate their goal progress, make causal attributions of personal control regarding that progress, and adjust their perceptions of self-efficacy accordingly.

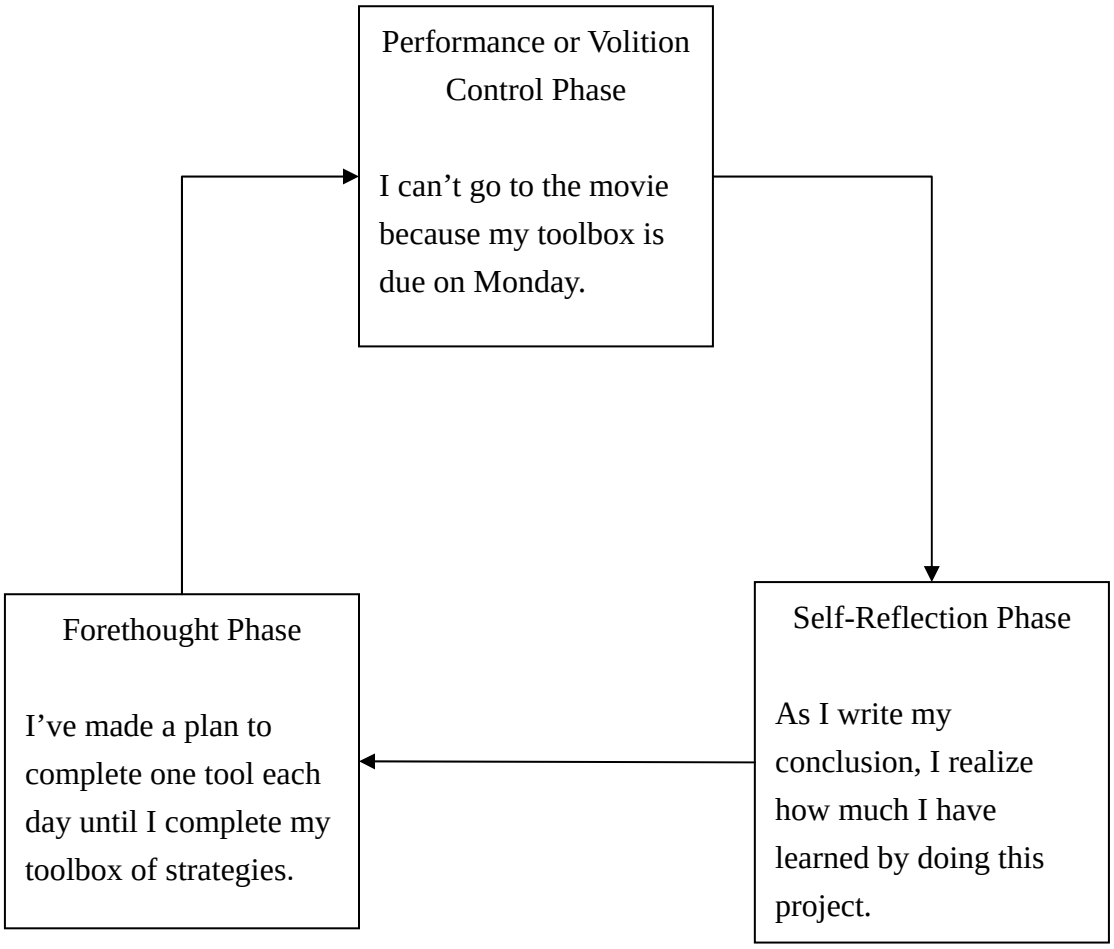


Figure 2 Self-regulation cycle (adapted from Alderman, 2004, pp. 135)

*Pintrich's Conceptual Framework for Self-Regulated Learning*

Pintrich (2004) pointed out that there are four general assumptions in most self-regulated learning models. These assumptions are:

(a) Active, constructive assumption: students play an active role in their learning, and they use the information available from the environments to construct their goals and learning strategies.

(b) Potential for control assumption: students can monitor, control, and regulate their cognition, motivation, and behaviors.

(c) Goal, criterion, or standard assumption: students have some type of goals, criteria, or standards with which they can assess their learning progress.

(d) Self-regulatory activities are mediators between personal and contextual characteristics and actual achievement or performance.

Based on these assumptions, Pintrich and Zusho (2002) represented a four-phase self-regulated learning model. These phases include: (a) forethought, planning, and activation; (b) monitoring; (c) control; and (d) reaction and reflection. They claimed that these phases represented a general time-ordered sequence in which an individual processes his/her task. However, there was no strong assumption that these phases are hierarchically or linearly structured. The first phase involves planning and goal setting as well as activation of perceptions and knowledge of the task and context and the self in relation to the task. The second phase focused on different monitoring processes that represent metacognitive awareness of different aspects of the self and task or context. In phase three, the efforts to control and regulate different aspects of the self or task and context were emphasized. At the final phase, various kinds of reactions and reflections on the self and the task or context were represented (see Table 3).

Table 3

Phases and Areas for Self-Regulated Learning (adapted from Pintrich and Zusho, 2002, pp. 252)

| | Area for Regulation | | | |
|---|---|---|---|---|
| Phases | Cognition | Motivation/Affect | Behavior | Context |
| Forethought, planning, and activation | • Target goal setting<br>• Prior content knowledge activation<br>• Metacognitive knowledge activation | • Goal orientation adoption<br>• Efficacy judgments<br>• Ease of learning judgments (EOLs), perceptions of task difficulty<br>• Task value activation<br>• Interest activation | • Time and effort planning<br>• Planning for self-observations of behavior | • Perceptions of task<br>• Perceptions of context |
| Monitoring | • Metacognitive awareness and monitoring of cognition, judgments of learning (JOLs) | • Awareness and monitoring of motivation and affect | • Awareness and monitoring of effort, time use, need for help<br>• Self-observation of behavior | • Monitoring changing task and context conditions |
| Control | • Selection and adaptation of cognitive strategies for learning, thinking | • Selection and adaptation of strategies for managing motivation and affect | • Increase/decrease effort<br>• Persist, give up<br>• Help-seeking behavior | • Change or renegotiate task<br>• Change or leave context |
| Reaction and reflection | • Cognitive judgments<br>• Attributions | • Affective reactions<br>• Attributions | • Choice behavior | • Evaluation of task<br>• Evaluation of context |

*Factors in Self-Regulated Learning*

Both cognitive and motivation/affect factors are involved in self-regulated learning. The cognitive factors include maturational/age-related and expertise/experience-related factors (Pintrich & Zusho, 2002). For example, young children are less able to use their cognitive resources as effectively or efficiently as older students because of the developmental differences. Also, prior knowledge of a domain or a topic area is positively associated with memory, learning, thinking, and problem solving (Pintrich & Zusho, 2002). Students who are experts in a domain perform better on memory and learning tasks than novices, whereas they are also more self-regulated. In addition, metacognitive knowledge, including declarative knowledge about a person, a task, and strategy variables that affect cognitive performance, also contributes to self-regulation. Older students have much more metacognitive knowledge than younger children, thus, are more self-regulated.

Efficacy-competence judgments, interest and value beliefs, and goal orientations are motivational factors which could facilitate or constrain self-regulated learning. Self-monitoring is an important component in self-regulation. By self-monitoring, students will be able to judge their progress, their understanding, or their performance (labeled judgments of learning, JOLs), and then, use this information to control and regulate their learning behaviors to reduce the discrepancy between the goals and their current states. These judgments of learning are similar to judgments of competence or self-efficacy. Previous research has indicated that judgments of competence are positively correlated with self-regulation and actual performance (Pintrich & Zusho, 2002). Students who believe that they have the capabilities to perform or learn the task use

self-regulatory strategies much more frequently as well as do better on the task itself. However, there are developmental and individual differences in the correlation of self-efficacy and self-regulation. Young children who are usually more positive about their capabilities are also unrealistic, and thus are less likely to see the need to regulate or change their behaviors (Pintrich & Zusho, 2002). On the other hand, although older students are more negative about their competence, they are more realistic about their capabilities and willing to change their behaviors. In addition, students who underestimate their actual competence are less self-regulated because of not having adequate self-efficacy, whereas those who overestimate their capabilities are also less self-regulated because they do not see the need to do so. Furthermore, students who hold the entity theory of intelligence (intelligence is fixed and stable) may think self-regulation is time consuming and the cost of adopting self-regulatory strategies are too high. In contrast, students who hold the incremental theory of intelligence (intelligence is changeable and malleable through effort and learning) can see the advantages of using self-regulatory strategies in order to improve their skills, even if there are costs in terms of time and effort.

Self-regulation is an effortful and time-consuming activity, and requires much of an individual's mental effort and commitment (Pintrich & Zusho, 2002). Therefore, students who are personally interested in a task, or those who place high values on a task are more likely to be self-regulated. In other words, high interest and high value beliefs lead students to use more self-regulation learning strategies. Moreover, if students set their learning goals as learning and improving (mastery-approach goals), then they are more likely to use self-regulatory strategies, such as monitoring their performance and

attempting to control and regulate their learning. Also, if students set their learning goals such as to outperform others (performance-approach goals), they are more likely to use self-regulatory strategies because they need to involve themselves in the tasks of besting others. On the other hand, if students set their learning goals as avoiding looking incompetence (performance-avoidance goals), they are less engaged in tasks and demostrate less self-regulation.

To conclude, students who can regulate their own cognition, motivation, behavior and their environment are more likely to be successful in academic setting. Further, older students are more able to self-regulate than younger students, and self-regulatory capabilities also increase as a student gains experience and expertise in doing a task. Both cognitive and motivational factors can facilitate and constrain the development of self-regulation in school contexts. In general, prior content knowledge, metacognitive knowledge, high self-efficacy, high interests and value beliefs, and mastery-approach goals lead individuals toward self-regulation.

*Measurements for Self-Regulated Learning*

Two tools in terms of measuring self-regulated learning have been used in previous studies, Self-Regulated Learning Interview Schedule (SRLIS; Zimmerman & Martinez-Pons, 1986) and Motivation Strategies for Learning Questionnaire (MLSQ; Pintrich, Smith, Garcia & McKeachie, 1993).

*(1) Self-Regulated Learning Interview Schedule (SRLIS)*

Zimmerman and Martinez-Pons (1986) developed Self-Regulated Learning Interview Schedule (SRLIS) in order to compare the degrees of using

self-regulated learning strategies between high and low achievement high school students. This interview instrument consisted of six different learning contexts, in classroom, at home, when completing writing assignments outside class, when completing mathematics assignments outside class, when preparing for and taking tests, and when poorly motivated. Students were asked to indicate the strategies they used in each context. Their responses were categorized into 14 self-regulated learning strategies categories, which were mostly rooted in social learning theory and research (Table 4). They summarized the interview data by three strategies: what strategy was used (SU), how often a particular strategy was mentioned in each context (SF), and if the strategy was consistently mentioned across different context (SC). The results indicated that high achievement students reported significantly greater use of 13 categories of self-regulated learning strategies. In addition, by using discriminant function analysis, the results indicated that the SRLIS can successfully predict the membership of the students' respective achievement group based on their reported self-regulated learning strategies. In addition, the regression results indicated that SRLIS results were a good predictor of standardized achievement test scores.

Table 4

Self-Regulated Learning Strategies Categories (Adapted from Zimmerman and Martinez-Pons, 1986)

| Categories of Strategies | Definitions |
|---|---|
| 1. Self-evaluation | Statements indicating student-initiated evaluations of the quality or progress of their |

| Categories of Strategies | Definitions |
|---|---|
| | work, e.g., “I check over my work to make sure I did it right.” |
| 2. Organizing and transforming | Statements indicating student-initiated overt or convert rearrangement of instructional materials to improve learning, e.g., “I make an outline before I write my paper.” |
| 3. Goal-setting and planning | Statements indicating student setting of educational goals or subgoals and planning for sequencing, timing, and completing activities related to those goals, e.g., ‘First, I start studying two weeks before exams, and I pace myself.” |
| 4. Seeking information | Statements indicating student-initiated efforts to secure further task information from nonsocial sources when undertaking an assignment, e.g., “Before beginning to write the paper, I go to the library to get as much information as possible concerning the topic.” |
| 5. Keeping records and monitoring | Statements indicating student-initiated efforts to record events or results, e.g., “I took notes of the class discussion.” “I kept a list of the words I got wrong.” |
| 6. Environmental structuring | Statements indicating student-initiated efforts to select or arrange the physical setting to make learning easier, e.g., “I isolate myself from anything that distracts me.” “I turned off the radio so I can concentrate on what I am doing.” |
| 7. Self-consequences | Statements indicating student arrangement or imagination of rewards or punishment for |

| Categories of Strategies | Definitions |
|---|---|
| | success or failure, e.g., 'If I do well on a test, I treat myself to a movie. |
| 8. Rehearsing and memorizing | Statements indicating student-initiated efforts to memorize material by overt or covert practice, e.g., "In preparing for a math test, I keep writing the formula down until I remember it." |
| 9-11. Seeking social assistance | Statements indicating student-initiated efforts to solicit help from peers (9), teachers (10), and adults (11), e.g., "If I have problems with math assignments, I ask a friend to help." |
| 12-14. Reviewing records | Statements indicating student-initiated efforts to reread tests (12), notes (13), or textbooks (14) to prepare for class or further testing, e.g., "When preparing for a test, I review my notes." |
| 15. Other | Statements indicating learning behavior that is initiated by other persons such as teachers or parents, and all unclear verbal responses, e.g., "I just do what the teacher says." |

*(2) Motivation Strategies for Learning Questionnaire (MSLQ)*

MSLQ was developed by Pintrich et al. (1993) in order to understand college students' motivation and learning strategies they used in a college course. It is a self-report, seven-point Likert-type scale with 81 items and takes about 20 to 30 minutes to administer. It was based on a general cognitive view of motivation and learning strategies, whereas the motivation subscale was based on social-cognitive

model of motivation, and the learning strategies subscale was based on general cognitive model of learning and information processing (Pintrich et al., 1993). The 31-itme motivation subscale consisted of three motivation constructs, expectancy (self-efficacy and control belief), value (intrinsic or extrinsic goal and task value beliefs), and affect (task anxiety). The 50-item learning subscale included three general types of constructs, cognitive (basic and complex strategies, such as rehearsing, elaboration, organization and critical thinking), metacognitive (planning, monitoring, and regulating), resource management (time management and using proper place to study), as well as peer learning and help seeking. The subscales and internal consistency is shown on Table 5.

Pintrich et al. (1993) conducted two confirmatory factor analysis, one for motivation subscale and one for learning strategies subscales), in order to examine the fit between the MSLQ items and theoretical concepts. The predictive validity was examined by the correlation between the MSLQ subscales scores and the standardized final course grade. Both analyses suggested that the MSLQ is a valid measure for motivation and learning strategies. The results from the confirmatory factor analysis of the motivation and the learning strategies subscales indicated a model fit. The correlations between the MSLQ subscales scores and standardized final course grade reached statistically significant except the correlation between extrinsic motivation and final grade, between peer learning and final grade, and between help-seeking and final grade. In other words, college students who were intrinsic goal orientated, who believed the course was interesting and important, who had higher level of self-efficacy for accomplishing the course work, and who

believed themselves as in control of their learning were more likely to earn a better course grade. Also, students who used more learning strategies, such as elaboration, organization, critical thinking, and metacognitive self-regulation, and who can managed their study time, environment, and efforts successfully were more likely to receive a higher grade. On the other hand, students who were experiencing higher level of test anxiety were less likely to get a good grade.

Table 5

Subscales and Internal Reliability Coefficients for Motivation Strategies for Learning Questionnaires (Modified from Pintrich et al., 1993, pp. 808)

| Scale | Coefficient Alpha |
|---|---|
| Motivation Scales | |
| Intrinsic Goal | 0.74 |
| Extrinsic Goal | 0.62 |
| Task Value | 0.90 |
| Control of Learning Beliefs | 0.68 |
| Self-efficacy for Learning and Performance | 0.93 |
| Test Anxiety | 0.80 |
| Learning Strategies Scales | |
| Rehearsal | 0.69 |
| Elaboration | 0.75 |
| Organization | 0.64 |
| Critical Thinking | 0.80 |
| Metacognitive Self-Regulation | 0.79 |
| Time and Study environment Management | 0.76 |
| Effort Regulation | 0.69 |
| Peer Learning | 0.76 |
| Help Seeking | 0.52 |

*Self-Regulated Learning in Traditional Learning Settings*

Early research in self-regulated learning focused on traditional learning settings. Previous researchers have studied the connection and the relationship between personal characteristics, self-regulated learning and academic achievement (Pintrich & DeGroot, 1990; Zimmerman, Martinez-Pons, 1990).

Zimmerman and Martinez-Pons (1986) found that high achieving students demonstrated a higher level of use of self-regulated learning strategies than low achieving students did. Further, they also found that self-regulated learning was the positively factor in predicting the standardized test performance. In addition to the evidence provided by this research, Zimmerman and Martinez-Pons (1988) conducted a similar research in order to construct validation of their self-regulated learning strategy model. A total of eighty high school students, 44 males and 36 females, were interviewed regarding their self-regulated learning strategies used under six different learning contexts, remembering learning materials, writing papers, completing math assignments, preparing in class tests, completing homework, and improving study at home. They also developed a teacher scale to rate the students' self-regulated learning outcomes. The results indicated that students' performance on a standardized achievement test was correlated with some self-regulated learning strategies.

In 1990, they compared gender and grade difference in mathematics and verbal academic self-efficacy, and self-regulated learning between gifted and regular students by using an adapted version of the Self-Regulated Learning Interview Schedule. Ninety students, including 45 boys and 45 girls, and 30 $5^{th}$ grade, 30 $8^{th}$ grade, and 30 $11^{th}$ grade students participated in this study. The Self-Regulated Learning Interview Schedule

included eight different learning contexts, in classroom situations, when completing writing assignments, when completing mathematics assignments, when checking science or English homework, when preparing for a test, when taking a test, when poorly motivated to complete homework, and when studying at home. Fourteen categories of self-regulated learning strategies were assessed. They found that gifted students had higher levels of self-efficacy in verbal and math. In addition, they had higher levels of self-regulation and more effectiveness learning strategies. Furthermore, they also found that students' perception of self-efficacy was related to self-regulated learning strategies.

Zimmerman, Bandura, and Martinez-Pons (1992) generated a causal model of student self-motivation, and used path analysis to examine the casual relationship among self-efficacy, goal setting and academic achievement. One hundred and sixteen ninth and tenth graders participated in this study. Self-efficacy for self-regulated learning and self-efficacy for academic achievement, participants' grade goals and their parents' grade goal were measured. The results indicated that there were positive correlations between the self-efficacy for self-regulated learning and self-efficacy for academic achievement, between self-efficacy for academic achievement and students' grade goals, between parents' grade goals and students' grade goals, and students' grade goals and their final grades. The result from path analysis indicated that students' higher level of self-efficacy in self-regulated learning led to a higher level of self-efficacy in academic achievement, which then resulted in a better grade.

Pintrich and DeGroot (1990) examined the relationship between motivation orientation, self-regulated learning, and classroom performance (seatwork, exams/quizzes, and essays/report). One hundred and seventy-three seventh grade students participated in

this study. They created an early version of self-report Motivated Strategies for Learning Questionnaire (MSLQ). The motivation components included intrinsic value, self-efficacy, and test anxiety, while the self-regulated learning components consisted of strategy use and self-regulation. Based on the results, they found that motivation was statistically significant correlated with self-regulated learning. In addition, self-efficacy and self-regulation had stronger correlation with the classroom performance than the other variables did. Finally, the regression analysis results indicated that self-regulated learning, self-efficacy, and test anxiety were predictors of performance.

Garcia and Pintrich (1991) tried to develop a structural model to explain the relationship among intrinsic motivation, self-efficacy, and self-regulated learning. The sample was 367 college students. They used the Motivation Strategies for Learning Questionnaire (MSLQ) as their measures. Participants' levels of intrinsic motivation, levels of self-efficacy, and self-regulated learning were measured at the beginning of the semester and at the end of the semester. Based on the structural equation modeling results, they found that intrinsic motivation had strong effect on self-regulated learning and on self-efficacy. In addition, self-efficacy had strong effects on self-regulated learning.

Rao, Moely and Sachs (2000) investigated the relationship between cognitive and motivational variables and the math performance in low-, average-, and high-achieving students in Hong Kong. There students were measured by a Chinese version of MSLQ and a mathematics motivation questionnaire when they were 10 years old and 11 years old. They found that the levels of intrinsic motivation of low-achieving students decreased over time, and they also reported a greater level of test anxiety. However, there was no difference in self-regulated learning strategies used between low-achieving and

high-achieving students. In other words, they could not link the relationship between self-regulated learning strategies with math performance. Their research results did not support previous or later researches.

Clarke (2007) used MSLQ to examine the relationship among motivation, learning strategies, and undergraduate students' math performance. Three hundred and forty-seven undergraduate students participated in this study. The MSLQ was used to investigate the difference between students in foundational math classes and those in advanced math classes. She found that students in advanced level math class (Calculus) had higher levels of motivation and task values than those in basic level math class. Also, female students reported a higher level of effort and test anxiety while they also reported a lower level of self-efficacy by comparing than male students.

*Self-Regulated Learning as the Mediator in Online Learning Settings*

Pintrich (2004) pointed that one of the general assumptions for self-regulated learning is that self-regulated learning is the mediator between personal or contextual characteristics and academic performance. Previous research have tried to link the relationship between personal characteristics and self-regulated learning, and the relationship between self-regulated learning and course outcomes. However, there is no research that examine these variables simultaneously. Although research results indicated that there were statistically significant relationships between self-regulated learning and course outcomes (Artino, 2009; Artino & McCoach, 2008; Paechter et al., 2010; Puzziferro, 2008; Yukselturk & Bulut, 2007), research results addressing the relationship between personal characteristics and self-regulated learning were not consistent. Some

research results indicated there was no statistically significant relationship between personal characteristics and self-regulated learning (Yukselturk & Bulut, 2009), while other research indicated that there were statistically significant relationships (Lim et al., 2006).

For example, Artino (2009) tried to link the relationship between personal factors and academic success in an online course. He had 481 undergraduate students in the military academy complete a survey that included the measures of self-efficacy, task value, self-regulated learning strategies (elaboration and metacognition), course satisfaction, and continuing motivation to enroll in future online courses. The regression data analysis results indicated that task value was the strongest positive predictor of self-regulated learning strategies and the motivation in continuing online courses, while self-efficacy was the moderately strong positive predictor of satisfaction.

Puzziferro (2008) examined the relationship among online technologies self-efficacy, self-regulated learning, and final grade and course satisfaction in college level online courses. Eight hundred and fifteen college students participated in this study. A series of one-way ANOVAs were used to answer the research questions. After analyzing responses, the results indicated that technology self-efficacy is not a statistically significant factor in terms of predicting students' final grades. On the other hand, self-regulated learning was positively correlated with final grades. Also, students' learning strategies were statistically significantly positively correlated with satisfaction.

Similarly, Paechter et al. (2010) conducted a nationwide research examining the relationship between factors that contributed to learning achievement and course satisfaction. Two thousand one hundred and ninety-six students from 29 universities in

Austria participated in this study. Based on the regression results, they found that self-regulation was a positive predictor of learning achievement.

Yukselturk and Bulut (2009) conducted research to determine if there were gender differences in self-regulated learning in online learning settings. The sample consisted of 145 participants. MLSQ was used as their measure to determine the self-regulated learning components, the levels of motivation beliefs, and achievement. Based on the regression results, they found that only test anxiety can statistically significantly predict female students' achievement, while self-efficacy for learning and performance, and task value were the statistically significant predictors for male students' achievement. However, they were unable to find any gender differences in terms of the level of self-regulated learning based on the MANOVA results.

## Technology Self-Efficacy

According to Zimmerman's model, self-efficacy is a key competence belief in self-regulatory control processes, such as goal setting and strategy selection (Pintrich & Schunk, 1996; Schunk & Zimmerman, 2006). The concept of self-efficacy was introduced by Bandura (1977a). He defined perceived self-efficacy as personal judgments of one's capabilities to organize and execute courses of action to attain designated goals. In other words, self-efficacy indicated the beliefs of the capabilities of what one can do in a specific domain. Self-efficacy has an effect on task choice, effort, persistence and achievement. It also influences academic motivation, learning, and achievement (Schunk, & Pajares, 2002). From this point of view, students with positive self-efficacy regarding the online courses they take usually have more motivation and better performance on

these courses.

In addition to the self-efficacy in the specific online course, the skills of using online learning technologies are also important for students who enroll in online courses. The major computer skills used include the use of E-mails, Internet search engines, chat rooms, and databases. Students who fear computer technologies may experience confusion, anxiety, a loss of personal control, frustration, and withdrawal (Bates, & Khasawneh, 2004). However, previous researchers have found conflicting results regarding the relationship between technology self-efficacy and students' performance and satisfaction with online courses.

Bates and Khasawneh (2004) generated a hypothesized model to examine the relationship among previous success experiences with online learning technology, online learning technology anxiety, online learning technology self-efficacy, instructor-provided training, and motivation to use online learning technology. Two hundred and eighty-eight college students participated in this study. The path analysis results indicated that both the training provided by instructors and previous success experience with online learning technologies can reduce the anxiety of online learning technologies, as well as increase the online learning technology self-efficacy. Furthermore, online learning technology self-efficacy will influence the motivation to use online learning technologies. In their another study (2007), they considered online learning self-efficacy as a mediator variable between antecedent variables, such as online learning anxiety, instructor feedback, and training, and outcome variables, such as outcome expectations, mastery perceptions, and hours per week spend on the online courses. They used the same sample, 288 college students, and the hierarchical multiple regression results indicated that online learning

self-efficacy was a significant factor in predicting the outcome variables. Also, it was the mediator between the antecedent variables and the outcome variables.

Joo et al. (2000) used 152 high school students as their sample and examined the relationship among gender, self-efficacy for self-regulated learning, academic self-efficacy, computer experiences, internet self-efficacy, and academic achievement in web-based courses. One hundred and fifty-two Korean junior high school students participated in this study. A path analysis revealed that students' self-efficacy for self-regulated learning was positively correlated with academic self-efficacy. However, students' academic achievement and internet self-efficacy were not the significant factors in terms of predicting the performance. Also, Liu (2007) examined the relationship among psychological readiness, technology self-efficacy, social readiness, and performance in community college online courses. However, regression analysis results indicated that technology self-efficacy was not a significant factor in predicting final grades.

DeTure (2004) examined the students' attributes to predict the academic success in Web-based courses by using the Online Technology Self-Efficacy Scale (OTSES; Miltiadou & Yu 2000). She analyzed the responses from 73 participants, and found that technology self-efficacy was not a significant factor in terms of predicting students' final grade. Further, Wang and Newlin (2002) investigated the relationship between technology self-efficacy and students' performance in online courses. They found that students with a higher level of technology self-efficacy tend to have higher final exam grades. However, even though a higher level of technology self-efficacy was related to the exam grades, it failed to predict the final grade at the end of the semester. Their

findings were also supported by Puzziferro (2008).

## Course Outcomes and Students' Characteristics

Some researchers have tried to establish relationship between students' characteristics and previous online learning experience, and their satisfaction and performance in online learning settings (Marks et al., 2005; Sanders & Morrison-Shetlar, 2001; Thurmond et al., 2002). However, they found that these variables cannot consistently predict students' performance and satisfaction with their online learning experiences.

Paechter et al. (2010) tried to link the relationship among student's expectations of online courses, experience in taking online courses, perceived learning achievement, and course satisfaction. Two thousand one hundred and ninety-six students with 62% females and 37.4 % males participated in this research. Multivariate multiple regression analysis results indicated that gender, age, or number of online courses taken could not statistically significantly predict students' performance in online courses. Also, students' expectations can positively predict students' achievement, while students' motivation and previous online learning experiences can positively predict both students' achievement and course satisfaction.

Arbaugh (2001) examined the relationship among the instructor immediacy behavior, students' satisfaction, and learning. He defined immediacy behavior as a nonverbal or verbal communication behavior which can reduce social and psychological distance between the instructor and the students, such as providing and inviting feedback, using humor, eye contact…etc. In a web-based course, he pointed that the instructor can still

use humor, provide feedback, and encourage discussion to demonstrate the immediacy behavior. He found that both the instructors' immediacy variables and students' attitudes toward the course software were positively associated with course satisfaction. In addition, numbers of previous internet courses have taken also a significant predictor in predicting course satisfaction.

Marks et al. (2005) examined the relationship among gender, prior student experience with online courses, student perceived learning and satisfaction. They proposed a model in which students' gender, and prior experience with online courses were the antecedent variables, whereas perceived learning was the mediator, and satisfaction was the outcome variable. Based on the structural equation modeling data analysis results by LISREL, gender and prior experiences did not influence students' perceived learning. Furthermore, they also found that students could not distinguish the difference between perceived learning and satisfaction.

Lim et al. (2006) examined the relationships between course outcomes and learner characteristics in an online learning setting. They used course satisfaction, learning gains, and learning application as the operational variables for course outcomes, while gender, age, distance learning experience, online learning preference over classroom, and work status were used as the operational variables for learner characteristics. One hundred and twenty-five students, including 39 males and 86 females, from a program evaluation online course participated in this study. Based on the ANOVA analysis, there was no gender difference in terms of students' performance or course satisfaction. However, students aged between 20 to 29 years had significantly higher scores in learning gains. Students with more experience in taking online courses had higher levels of motivation

and higher course satisfaction than those students who had less experience in taking online courses. As for the correlation analysis, they found that learning motivation was moderately correlated with course satisfaction, and the regression analysis results indicated that learning motivation can predict students' learning gain.

Thurmond et al. (2002) examined the relationship between students' satisfaction and the online learning environment by controlling students' gender and the number of prior online courses have taken. They collected responses from 120 students and analyzed the data through correlations and hierarchical regression analysis. The results indicated that students' satisfaction was affected by the online learning environmental factors. However, gender and the number of prior online courses taken failed to predict students' satisfaction.

Arbaugh (2000) tried to examine the effects of technological, pedagogical, and students' characteristics in internet-based online courses. Ninety-seven MBA students participated in this study. He found that older and female students reported higher level of perceived learning than younger or male students in online learning settings based on the multiple regression analysis. In his another research in 2004, he found that the degrees of students' perceived learning was not changed by their prior experience in taking online courses.

Yukselturk and Bulut (2007) also investigated gender differences in students' success on Web-based courses. The regression results indicating that there were no gender, age, educational level differences in predicting the achievement. In their another study, Yukselturk and Bulut (2009) found that for female students, task value was a negative factor in predicting students' achievement, while for male students, self-efficacy

and task values were significant predictors.

## Mediator and Moderator

Pintrich (2004) pointed out that that self-regulated learning is the mediator between personal or contextual characteristics and academic performance. Mediator and moderator variables serve different functions in the relationship between independent variables (IVs) and dependent variables (DVs) (Baron & Kenny, 1986; Neu, 2000). A mediator is a third variable which accounts for the relationship between the IVs and the DVs, whereas a moderator is a qualitative or quantitative variable that influences the direction or strength of the relationship between IVs and DVs. In other words, a mediator implies a causal relationship between IVs and DVs and helps researchers understand how or why this effect occurs. On the other hand, a moderator affects the zero-order correlation between IVs and DVs. The mediator effect has to fulfill the following three conditions: (a) variations in IVs significantly account for variations in the mediator; (b) variations in mediator significantly account for variations in the DVs; and (c) when (a) and (b) are controlled, the relationship between IVs and DVs are either no longer significant or very small. Therefore, a path analysis or structural equation model are often used to detect a mediator effect. In Figure 3, Self-regulated Learning is a mediator between Teaching Approach and Statistics Course Achievement. Teaching Approach influences students' level of Self-regulated Learning, and then leads to Course Achievement. In addition, path b and c should reach statistically significance, whereas when path b and c are controlled, path a is either no longer significant or very small. Moderator variables always function as independent variables. Therefore, moderator

effect can be detected by ANOVA. A moderator effect is supported if the interaction effect in Factorial ANOVA reaches statistically significance (path f in Figure 4).

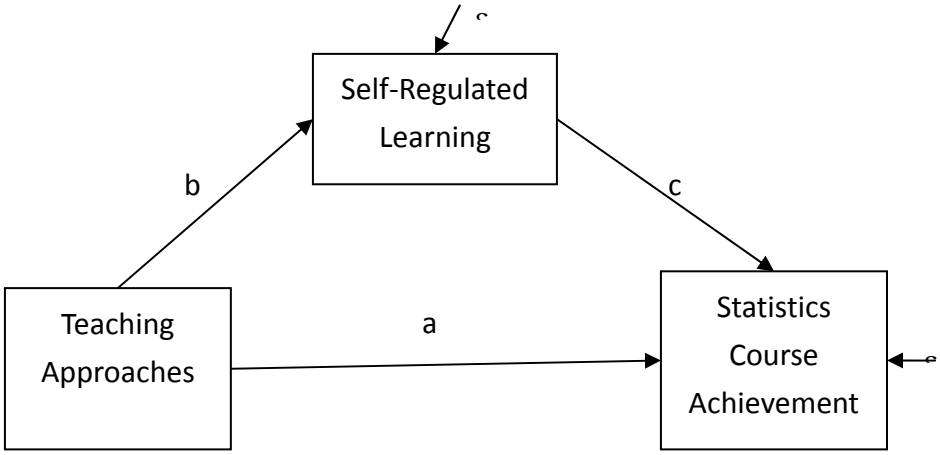


Figure 3 A mediator model

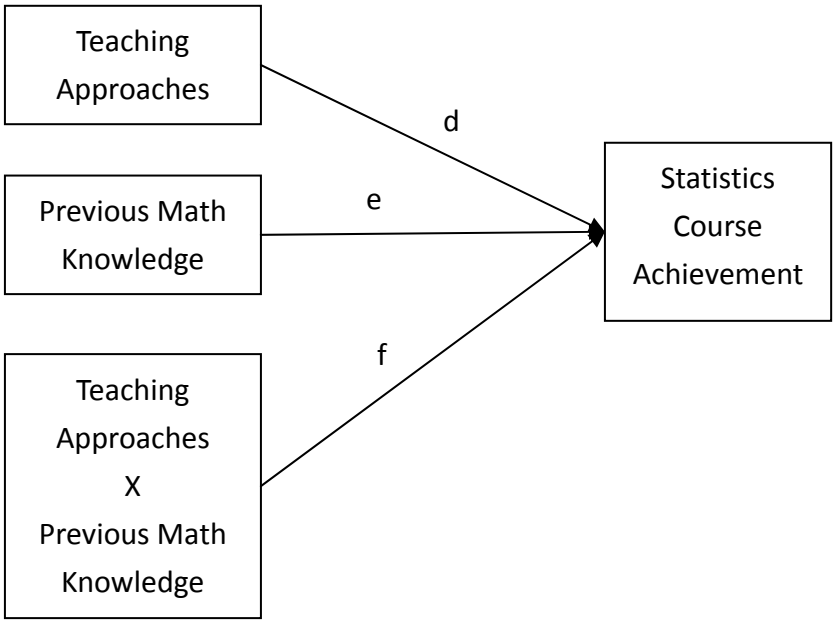


Figure 4 A moderator model

## Summary

In conclusion, with the increasing number of online courses offered in the market, the quality of the online course and learning becomes an important concern. Previous researchers suggested that course outcomes, including students' performance and course satisfaction, can be used as an evaluation criterion to examine the quality of online courses. In addition, an online learning setting is different from a traditional classroom setting. Students take more responsibility in their learning. Therefore, self-regulated learning is an important factor related to students' success in online learning settings. Pintrich (2004) asserted that self-regulated learning is the mediator between personal or contextual characteristics and academic performance. Previous research had linked the relationship between students' characteristics and self-regulated learning, and between self-regulated learning with course outcomes in online learning settings. Furthermore, students who take online courses need to feel comfortable in using online technology. Therefore, in addition to students' self-efficacy in accomplishing the online courses, students should have higher level of technology self-efficacy in order to success in online courses. However, previous research reported conflicting results in terms of the relationship between students' characteristics and technology self-efficacy, and between the technology self-efficacy and course outcomes. However, no research examined these factors simultaneously. In other words, no research really examined the mediator effect of self-regulated learning and technology self-efficacy. Hence, the current research generated a hypothesized model and intended to examine if this hypothesized model can explain the relationship among students' characteristics, self-regulated learning, technology self-efficacy, and course outcomes.

# III. METHOD

This chapter focused on the methods used in the current study. The purpose of study is first stated, followed by participants, instrumentation, and data analysis technique.

## Purpose of Study

The research problem addressed the needs to have an overall view of the relationship among students' characteristics and previous online learning experiences, self-regulated learning, technology self-efficacy, and course outcomes to improve the quality of online courses. Therefore, the purpose of current study is to determine the relationship among students' characteristics and previous experience in online learning, self-regulated learning (motivation and learning strategies), technology self-efficacy, and the course outcomes (course performance and course satisfaction). A hypothesized model was generated based on previous studies (Figure 1 in Chapter I). More specific, the current study is focused on the following research questions:

(1) Overall, can the hypothesized model explain the relationship among students' characteristics and previous online learning experiences, self-regulated learning (motivation and learning strategies), technology self-efficacy, and course outcomes (achievement and course satisfaction) in online learning settings?

(2) Do students' characteristics and previous online learning experiences influence self-regulated learning, technology self-efficacy, and course outcomes (achievement, and satisfaction) in online learning settings?

(3) A. Does students' self-regulated learning influence the course outcomes in online learning settings?

B. Does students' technology self-efficacy influence the course outcomes in online learning settings?

C. Do students' self-regulated learning and technology self-efficacy interact with each other?

(4) Are self-regulated learning and technology self-efficacy mediators between students' characteristics, and the course outcomes?

## Research Design

A non-experimental quantitative research designed with self-report survey measures was used in this study. The reason was that the participants could not be randomly assigned to different levels of motivation, self-efficacy, and different types of learning strategies. All data were collected anonymously. The strength of this type of research design is that the participants can truly present their experiences in online learning settings without being concerned with social expectations. However, this research design still has its weakness. Because of the self-report responses, the data are vulnerable to reactivity, response bias, and response sets.

## Participants

In examining the relationship among students' characteristics and previous online learning experiences, self-regulated learning, technology self-efficacy, and course outcomes, the generalized population consists of students who enroll in online courses at major universities or colleges in the United States. Based on the distance education statistics (Parsad, Lewis & Tice, 2008), 9,803,000 undergraduates and 2,349,900 graduates enrolled in distance courses in 2007-2008 academic year. Assessable population will be the undergraduate or graduate students who enrolled in online courses in the state of Alabama. According to postsecondary education statistics, a total of 258,408 students enrolled in degree-granting institutions at Alabama State (NCES, 2008).

In the current study, participants were selected by cluster sampling method from the students at Auburn University who enrolled in online courses during Fall, 2008, Spring, 2009, Summer, 2009, and Fall, 2009. One hundred and thirty-nine online courses were offered in Fall, 2008 with 1570 student enrollments, whereas 85 courses were provided in Spring, 2009 with 879 enrollments. In Summer, 2009, the university offered 93 online courses with 1069 enrollments, while 171 online courses were offered in Fall, 2009, with 1909 student enrollments.

A total of 488 courses were included in current study with 2139 students enrolled at least one online course. These students were invited to participate in the current research, including 1164 graduate students (497 females and 667 males), and 975 undergraduate students (553 females and 422 males) who enrolled in at least one online course.

Among 2139 invitation e-mails, only 2124 e-mails were successfully sent out. Two hundred and fifty-six completed surveys were returned, with the response rate at 12.05%. The returned responses included 121 males (47.3%), and 135 females (53.1%), whereas 95 (37.11%) of them were graduate students, and 161 (62.89%) of them were undergraduate students. Table 6 shows the comparison between sample pool and returned response in terms of the frequency and the percentage of gender and educational level.

Table 6

Comparing the Frequency and Percentage of Gender and Educational Level between the Sample Pool and the Returned Responses

| | | Frequency | Percent |
|---|---|---|---|
| Sample Pool (N = 2139) | Male | 1089 | 50.91% |
| | Female | 1050 | 49.09% |
| | Graduate | 1164 | 54.42% |
| | Undergraduate | 975 | 45.58% |
| Returned Responses (n = 256) | Male | 121 | 47.27% |
| | Female | 135 | 52.73% |
| | Graduate | 95 | 37.11% |
| | Undergraduate | 161 | 62.89% |

Two goodness-of-fit Chi-square tests were used to examine if the gender and the educational level distributions of the returned responses were the same as those of the sample pool. The results indicated that the gender distribution of the returned responses was the same as it was of the sample pool ($\chi^2 = 1.266, df = 1, p = 0.261$). However, the educational level distribution of the returned responses was different from the sample pool ($\chi^2 = 30.475, df = 1, p < 0.001$). There were more graduate students in the

sample pool (54.42%) than the undergraduate students (45.58%). However, the undergraduate students were more willing to complete the survey (62.89%) than the graduate students were (37.11%).

Most of the participants were Caucasian ($n = 216, 84.4\%$). Others were African American, Asian, Hispanic or Latino, and others, with the percentage at 8.2%, 1.2%, 3.2%, 1.2%, respectively. Five participants did not reveal their ethnicity (2.0%) (Table 7). Most of the participants were aged between 19 to 39 (Table 8), and their educational level ranged from freshman (2.3%), sophomore (5.5%), junior (12.5%), senior (42.6%), master program (32.8%), doctoral program (3.1%), to special program (1.2%) (Table 9). Most of them were enrolled in the Business College (32.8%), the Education College (27.0%), and the Engineering College (18.4%). Others were enrolled in Agriculture (2.7%), Architecture, Design, and Construction (0.8%), Forestry and Wildlife Sciences (0.8%), Human Science (3.9%), Liberal Arts (9.8%), Nursing (0.4%), Pharmacy (0.4%), and Science and Mathematics College (3.1%) (Table 10). Most of them completed their recent online course in Summer, 2009 (41.4%) (Table 11).

Table 7

Frequency Table of the Participants' Ethnicity

| | Frequency | Percent |
|---|---|---|
| Caucasian | 216 | 84.4 |
| African American | 21 | 8.2 |
| Hispanic or Latino | 8 | 3.1 |
| Asian | 3 | 1.2 |
| Others | 3 | 1.2 |
| Missing | 5 | 2.0 |

| | Frequency | Percent |
|---|---|---|
| Total | 256 | 100.0 |

Table 8

Frequency Table of the Participants' Age

| | Frequency | Percent |
|---|---|---|
| 19-24 | 77 | 30.1 |
| 25-59 | 60 | 23.4 |
| 30-39 | 70 | 27.3 |
| 40-49 | 30 | 11.7 |
| 50+ | 19 | 7.4 |
| Total | 256 | 100.0 |

Table 9

Frequency Table of the Participants' Highest Level of Education

| | Frequency | Percent |
|---|---|---|
| Freshman | 6 | 2.3 |
| Sophomore | 14 | 5.5 |
| Junior | 32 | 12.5 |
| Senior | 109 | 42.6 |
| Master | 84 | 32.8 |
| Doctoral | 8 | 3.1 |
| Special | 3 | 1.2 |
| Total | 256 | 100.0 |

Table 10

Frequency Table of the Participants' College

| | Frequency | Percent |
|---|---|---|
| Business | 84 | 32.8 |
| Education | 69 | 27.0 |
| Engineering | 47 | 18.4 |
| Liberal Arts | 25 | 9.8 |
| Human Sciences | 10 | 3.9 |
| Sciences and Mathematics | 8 | 3.1 |
| Agriculture | 7 | 2.7 |
| Architecture, Design, and Construction | 2 | 0.8 |
| Forestry and Wildlife Sciences | 2 | 0.8 |
| Nursing | 1 | 0.4 |
| Pharmacy | 1 | 0.4 |
| Veterinary Medicine | 0 | 0 |
| Total | 256 | 100.0 |

Table 11

The Most Recent Online Course Completed

| | Frequency | Percent |
|---|---|---|
| Fall, 2009 | 74 | 28.9 |
| Summer, 2009 | 106 | 41.4 |
| Spring, 2009 | 47 | 18.4 |
| Fall, 2008 | 24 | 9.4 |
| Missing | 5 | 2.0 |
| Total | 256 | 100.0 |

## Procedures

The Demographic Questionnaire, Course Satisfaction Questionnaire (CSQ), Modified Motivation Strategies for Learning Questionnaire (Modified MSLQ), Modified Self-Regulated Learning Interview Schedule (Modified SRLIS), Online Technology Self-Efficacy Scale (OTSES), and students' characteristics questionnaire were used as the instruments (Appendix A). Because the instruments consisted of a total of 130 items, the researcher separates these items into 7 parts: Demography Questionnaire, CSQ, Modified MSLQ Motivation Scale, Modified MSLQ Learning Strategies Scale, Modified SRLIS, OTSES, and students' characteristics questionnaire. In order to avoid response sets and eliminate system error, a Latin Square Design was used to generate different forms of instrument. Since the instrument was divided into seven parts, a 7X7 Latin Square was generated so that each part of the instrument appears once in each row and once in each column. Since every part of instrument appears in each position once, the position effect is controlled (Kirk, 1995; Maxwell & Delaney, 2004).The assumption of the Latin Square is that the treatment effect, row effect, and column effect are independent of each other (Freund & Wilson, 2003). In other words, there are no interactions among the order of the instrument, the type of forms, and the contents of the instruments. The final seven forms of the questionnaire with their orders and SAS code used to generate the Latin Square are shown in Table 12. All 2139 potential participants were randomly assigned to seven groups. Each group received one type of survey form. All groups had the same combination of graduate and undergraduate students, and gender (Table 13).

Table 12

The Order of Different Forms of Questionnaire Generated by the Latin Square

| | Modified MSLQ | | | Technology | | | |
|---|---|---|---|---|---|---|---|
| | Motivation | Strategy | LS | Self-Efficacy | CSQ | LE | Demographics |
| Form A | 5 | 2 | 6 | 7 | 3 | 4 | 1 |
| Form B | 4 | 6 | 1 | 3 | 5 | 2 | 7 |
| Form C | 7 | 5 | 4 | 6 | 1 | 3 | 2 |
| Form D | 6 | 7 | 3 | 4 | 2 | 1 | 5 |
| Form E | 1 | 3 | 5 | 2 | 6 | 7 | 4 |
| Form F | 2 | 1 | 7 | 5 | 4 | 6 | 3 |
| Form G | 3 | 4 | 2 | 1 | 7 | 5 | 6 |

The number indicates the order of the questionnaire.

SAS code:

```
proc plan seed=37430;
factors rows=7 ordered cols=7 ordered / noprint;
treatments tmts=7 cyclic;
output out=g
cols cvals=('Motivation' 'Strategies' 'LS' 'Technology' 'CSQ' 'LE' 'Demographics') random
rows cvals=('Form A' 'Form B' 'Form C' 'Form D' 'Form E' 'Form F' 'Form G') random
tmts nvals=(1 2 3 4 5 6 7) random;
quit;
proc tabulate;
class rows cols;
var tmts;
table rows, cols*(tmts*f=6.) / rts=8;
keylabel sum='    ';
run;
```

Table 13

The Distribution of Each Survey Format for the Current Study

| Form | Graduate | | | Undergraduate | | | Total |
|---|---|---|---|---|---|---|---|
| | Male | Female | Total | Male | Female | Total | |
| A | 96 | 70 | 166 | 60 | 80 | 140 | 306 |
| B | 96 | 70 | 166 | 61 | 79 | 140 | 306 |
| C | 97 | 70 | 167 | 60 | 79 | 139 | 306 |
| D | 96 | 71 | 167 | 60 | 79 | 139 | 306 |
| E | 94 | 72 | 166 | 60 | 79 | 139 | 305 |
| F | 94 | 72 | 166 | 60 | 79 | 139 | 305 |
| G | 94 | 72 | 166 | 61 | 78 | 139 | 305 |
| Total | 667 | 497 | 1164 | 422 | 553 | 975 | 2139 |

The participants' e-mail addresses were obtained from the listings of online courses taught at Fall, 2008, Spring, 2009, Summer, 2009, and Fall, 2009. Using the course bulletin, and with the permission of the Director of the Office of Institutional Assessment, the rosters of these courses were obtained from the online listing. E-mail addresses were captured for e-mailing purpose only. Neither names nor other information was captured. The e-mail addresses were used to compile the mailing list. No other information was necessary and precautions were taken to ensure that an e-mail address can NOT be associated with any survey responses. The survey host was SurveyMonkey.com. The participants' IP addresses, e-mail addresses, or ID were not collected or saved in this website. The first question of the survey was: "Are you 19 years

old or older?" If the participants were not 19 years old or older, they were directed to the end of the survey and the thank you page.

Research invitations were sent to participants through University e-mail system. In the invitation e-mail, a link to access online survey website was included. It took about 30 minutes to finish the survey. A friendly notice was sent to participants via E-mail a week before the formal survey (Appendix B), and two friendly reminders were sent via E-mail to them a week and two weeks after the participant receive the formal survey (Appendix E and Appendix F). All data was collected anonymously.

The formal invitation e-mail allowed participants to access the survey (appendix C). By clicking the web link to survey provided by the e-mail, participants were considered to agree to participate in the study. However, they could withdraw from the study anytime when they closed the website without finished the survey. After they finish the items and click the "DONE" button, a thank you note (Appendix D) appeared on the screen, and the responses were registered.

The researcher also provided 20 five-dollar Amazon.com gift certificates and 10% off coupon codes for Auburn University Bookstore as the incentives for the participants who completed the survey. The participants were redirected to the raffle webpage which was hosted by Auburn University OIT (https://oitappstest.auburn.edu/Eric/Drawing/default.aspx) after they completed the survey. The 20 winners were randomly picked up from the first 500 participants who complete the survey and participate in the raffle. All participants received the 10% off coupon codes for Auburn University Bookstores once they finished the survey.

## Instrumentation

### *Variables*

1. Course Outcomes

   Course outcomes included two observed variables: course achievement and course satisfaction. Course achievement is measured by collecting data on students' self-reported final grade in their most recent online course. The grades included A, B, C, D, F, and W six categories. Course satisfaction was measured by a 21-item Course Satisfaction Questionnaire (CSQ) created by Frey, Yankelov, and Faul (2003). The contents include interaction between students and faculty, interaction among students, the relevancy of course content, and the teaching methods for delivering the content.

2. Self-Regulated Learning

   Self-regulated learning was measured by the Modified Motivation Strategies for Learning Questionnaire (Modified MSLQ) which was developed by Artino and McCoach (2008). Task value, self-efficacy for learning and performance, and test anxiety are three subscales in the motivation scale with a total of 19 items, while elaboration, critical thinking, metacognitive self-regulation, and time/study environmental management are four factors in the learning strategies scale with a total of 31 items. In addition, four open ended items which were modified from the Self-Regulated Learning Interview Schedule (Zimmerman & Martinez-Pons, 1986, 1988) were added to identify the learning strategies students used in online learning courses.

3. Technology Self-Efficacy

   Technology self-efficacy was measured by the Online Technologies Self-Efficacy Scale (OTSES) which was developed by Miltiadou and Yu (2000). One factor, online self-efficacy, with 29 items was comprised in this instrument.

4. Students' Characteristics

   These characteristics included gender, education level, and the number of online courses that had been taken.

*Instruments*

In the current study, standard procedures, such as Cronbach's alpha, factor analysis, were used to estimate reliability and validity.

*Course Satisfaction Questionnaire (CSQ)*

CSQ is a 7-point Likert type self-report questionnaire which was developed by Frey et al. (2003) to measure students' overall satisfaction with the online courses. It includes 21 items. Students were instructed to respond to the item from "completely dissatisfied" (1) to "completely satisfied" (7) with a possible range from 21 to 147. For example, item 13: "The time it took for your instructor to provide feedback on graded assignments." The higher scores represent more satisfaction with the online courses. Frey et al. (2003) reported an internal consistency Cronbach' alpha equals to 0.97, indicating an excellent reliability. They also found that the CSQ scores moderately to strongly positively correlated with web-assisted strategies, such as communication, course information, learning resources, assignment, and grading.

An exploratory factor analysis using a principal component extraction method and an oblimin rotation of a 21-item self-report course satisfaction questionnaire was administered to the participants at Auburn University (N=256). The Kaiser-Meyer-Olkin measure of sampling adequacy was 0.965, indicating that the present data were suitable for principal components analysis. Similarly, Bartlett's test of sphericity was significant ($p < 0.001$), indicating sufficient correlation between the variables to proceed with the analysis.

Using the Kaiser-Guttman retention criterion of eigenvalues greater than 1.0, a two-factor solution provided the clearest extraction accounting for 68.520% of the total variance. However, the scree plot indicated a dominant factor with eigenvalues at 13.334 (Figure 5), whereas the previous researchers only provided one structure for the Course Satisfaction Questionnaire. Therefore, one factor, Course Satisfaction, with 21-item was obtained. The corrected item-total correlation ranged from 0.587 to 0.866, and the Cronbach's coefficient alpha was 0.970, which was corresponded to the original structure (Table 14).

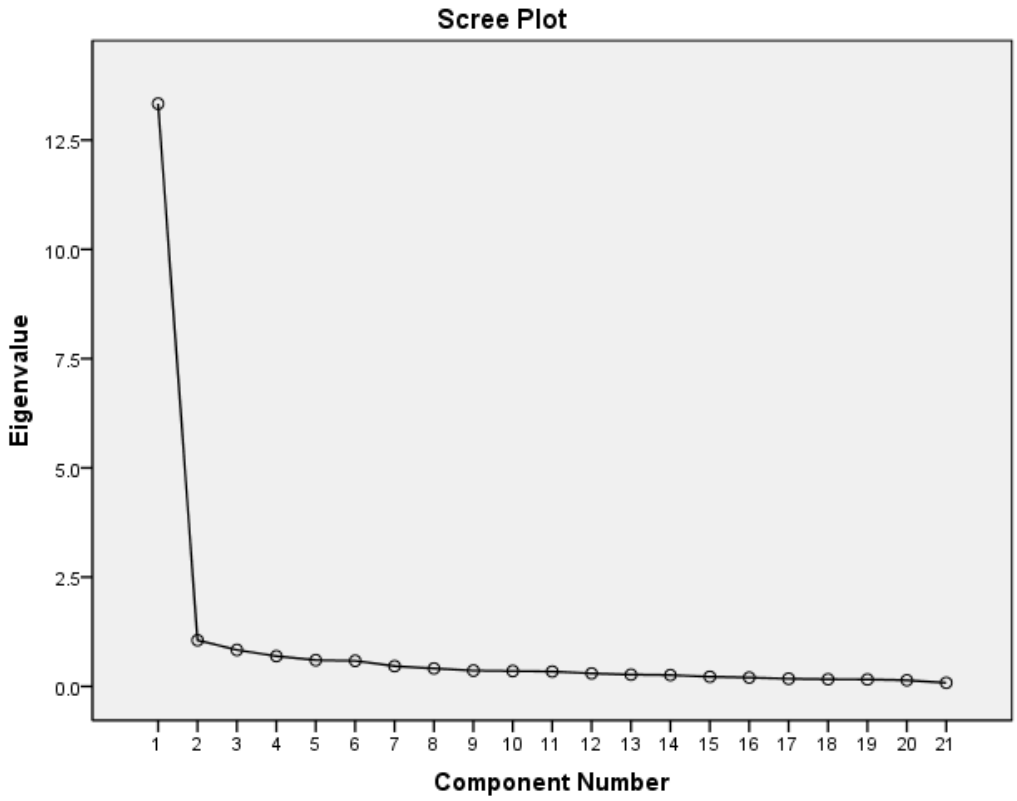


Figure 5 Scree plot for the Course Satisfaction Questionnaire

Table 14

The Factor Analysis Results for the Course Satisfaction Questionnaire

| Item # | Item | Factor Coefficients | | Item-Total Correlation |
|---|---|---|---|---|
| | | Course Satisfaction | 2 | |
| 20 | The increase in your knowledge and/or skills as a result of this course | **.948** | | 0.752 |
| 21 | The increase in your confidence in using the knowledge and/or skills as a result of this course | **.936** | | 0.770 |
| 11 | The learning value of the assignments | **.910** | | 0.802 |
| 16 | The teaching style of your instructor | **.896** | | 0.860 |
| 1 | The amount of interaction between you and your instructor | **.837** | | 0.827 |
| 19 | The accommodation of your approach to learning in the way this course was taught | **.835** | | 0.836 |
| 2 | The quality of interaction between you and your instructor | **.811** | | 0.828 |
| 18 | The instructor in terms of his devotion to the course | **.778** | | 0.794 |
| 9 | The extra learning resources provided to you (e.g. extra handouts, on-line resources, list of frequently asked questions, on-line discussion groups, on-line weekly quizzes) | **.773** | | 0.822 |
| 10 | The format of the different assignments | **.755** | | 0.830 |
| 4 | The manner in which the syllabus was distributed | **.753** | | 0.606 |

| Item # | Item | Factor Coefficients | | Item-Total Correlation |
|---|---|---|---|---|
| | | Course Satisfaction | 2 | |
| 17 | The assistance given by the instructor in completing the course successfully | **.751** | | 0.866 |
| 5 | The logical organization of the course content | **.751** | | 0.791 |
| 8 | The lecture notes provided to you | **.721** | | 0.783 |
| 6 | The reminders given to you about assignments due | **.604** | | 0.687 |
| 7 | The manner in which guidelines were given on the completion of assignments | **.598** | .369 | 0.821 |
| 3 | The cooperation between you and your classmates | **.566** | | 0.627 |
| 12 | The options available to you to hand in assignments | **.535** | .353 | 0.740 |
| 15 | Access to your grades during the semester | | .839 | 0.587 |
| 13 | The time it took for your instructor to provide feedback on graded assignments | **.367** | .613 | 0.751 |
| 14 | The quality of the feedback provided on graded assignments | **.440** | .549 | 0.783 |
| Internal Consistency Cronbach's α | | 0.970 | | |

*Modified Motivation Strategies for Learning Questionnaire (Modified MSLQ)*

The Motivation Strategies for Learning Questionnaire (MSLQ) was developed by Pintrich, Smith, Garcia, and McKeachie in 1993 as the measures of self-regulated learning. However, the MSLQ was designed for the traditional classroom settings, and it may not be appropriate to apply in online learning settings.

Artino and McCoach modified the original MSLQ to measure self-regulated learning in online learning settings. The modified MSLQ includes two major subscales: motivation (task value, self-efficacy, and test anxiety), and learning strategies (Elaboration, critical thinking, metacognitive self-regulation, and time/study environmental management). The motivation section consists of 19 items and the learning strategies section includes 31 items. Participants respond to each item using a 7-point scale, ranging from "not at all true of me" (1) to "very true of me" (7). Five out of total 50 items are reverse coded. Higher scores indicate higher level of motivation and learning strategies. Sample questions are: item 9: "I am confident I can understand the most complex material presented by the instructor in this course", and item 21: "I usually study in a place where I can concentrate on my course work."

The internal consistency using Cronbach's alpha for task value, self-efficacy, and test anxiety subscales were 0.90, 0.93, and 0.80, respectively. For elaboration, critical thinking, metacognitive self-regulation, and time/study environmental management, the reliability estimates were 0.75, 0.80, 0.79, and 0.76, respectively. No factor analysis of other support for validity was provided.

Artino and McCoach (2008) combined the task value and self-efficacy subscales together as a new scale, called Online Learning Value and Self-Efficacy Scale (OLVSES).

The internal consistency Cronbach's alpha for these two subscales were 0.85 and 0.87, respectively. In order to examine the criterion-related validity, they analyzed the relationship among the OLVSES, the Negative Achievement Emotions Scale, and the Cognitive and Metacognitive Learning Strategies Scale. The results indicated that the OLVSES score was statistically significantly correlated to each subscale of the Negative Achievement Emotions Scale score and the Cognitive and Metacognitive Learning Strategies Scale score ($r = -0.50 \sim 0.62, p < 0.001$). Furthermore, by using the multiple regression analyses, the OLVSES scores had been a good predictor for the other two scale scores ($\beta = -0.42 \sim 0.62, p < 0.001$).

An exploratory factor analysis using a principal component extraction method and an oblimin rotation of a 19-item self-report Motivation Subscale and 31-item Learning Strategies Subscale were administered to the participants at Auburn University (N=256). The Kaiser-Meyer-Olkin measure of sampling adequacy was 0.925 for the Motivation Subscale, and 0.916 for the Learning Strategies Subscale, indicating that the present data were suitable for principal components analysis. Similarly, Bartlett's test of sphericity was statistically significant for both subscales ($p < 0.001$), indicating sufficient correlation between the variables to proceed with the analysis.

1. Motivation Subscale of Modified MSLQ

Using the Kaiser-Guttman retention criterion of eigenvalues greater than 1.0, a three-factor solution provided the clearest extraction for the Motivation Subscale of the Modified MSLQ. The scree plot also suggested three-factor solution (Figure 6). These three factors accounted for 72.824% of the total variance. All items fell into the same

structure as the original research. Communities were fairly high for each of the 19 items, with a range of 0.518 to 0.850. The first factor, Self-Efficacy (eigenvalue=9.214), accounted for 48.493% of the variance and had 8 items. The second factor, Test Anxiety (eigenvalue=3.193), accounted for 16.808% of the variance and had 5 items. The final factor, Task Value (eigenvalue=1.430), accounted for 7.524% of the variance and had six items. The corrected item-total correlation ranged from 0.752 to 0.881 for the Self-Efficacy, and Cronbach's coefficient alpha was 0.947. The corrected item-total correlation ranged from 0.576 to 0.736 for the Test Anxiety, and Cronbach's coefficient alpha was 0.846, whereas the corrected item-total correlation ranged from 0.787 to 0.879 for the Task Value, and Cronbach's coefficient alpha was 0.945. Table 15 presents the 19 items, the factors they came from, their factor loadings, their item-total correlation, and their internal consistency Cronbach's alpha values.

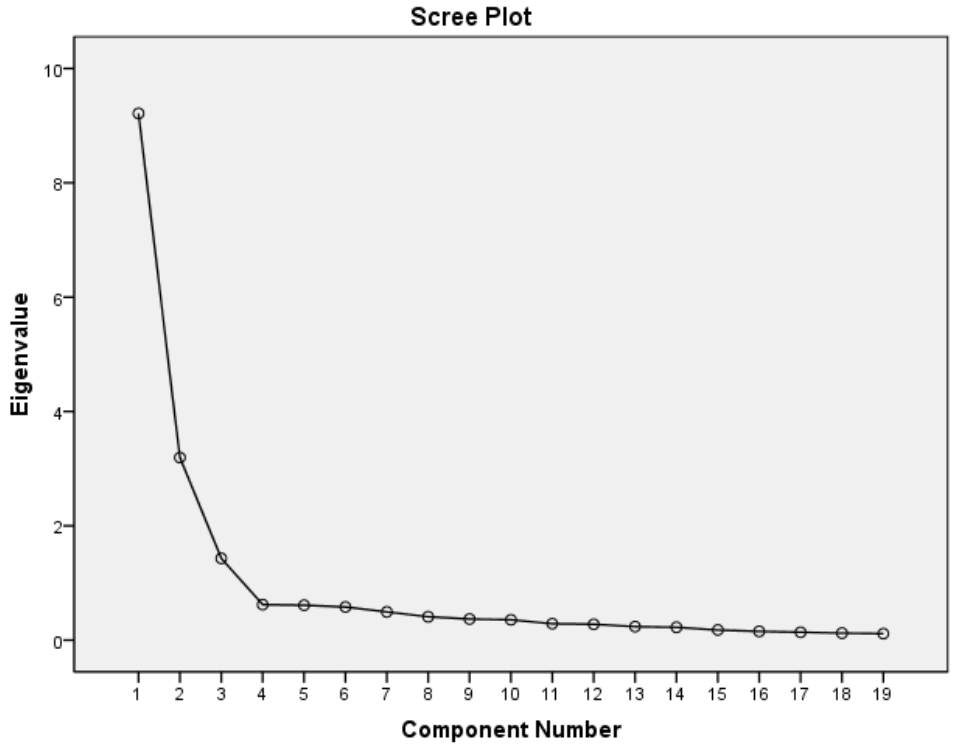


Figure 6 Scree plot for the Motivation Subscale of the Modified MSLQ

Table 15

The Factor Analysis Results for the Motivation Subscale of the Modified MSLQ

| Item # | Item | Factor Coefficients | | | Item-Total Correlation |
|---|---|---|---|---|---|
| | | Self-Efficacy | Test Anxiety | Task Value | |
| 13 | I expect to do well in this class. | **.954** | | | .780 |
| 1 | I believe I will receive an excellent grade in this class. | **.930** | | | .783 |
| 12 | I'm confident I can do an excellent job on the assignments in this course. | **.893** | | | .841 |
| 19 | Considering the difficulty of this course, the teacher, and my skills, I think I will do well in this class. | **.861** | | | .881 |
| 4 | I'm certain I can understand the most difficult material presented in the readings for this course. | **.692** | | | .772 |
| 9 | I'm confident I can understand the most complex material presented by the instructor in this course. | **.665** | | | .839 |
| 18 | I'm certain I can master the skills being taught in this class. | **.577** | | -.367 | .816 |
| 7 | I'm confident I can learn the basic concepts taught in this course. | **.562** | | -.328 | .752 |
| 11 | I have an uneasy, upset feeling when I take an exam. | | **.855** | | .736 |
| 17 | I feel my heart beating fast when I take an exam. | | **.810** | | .703 |
| 3 | When I take a test I think about how poorly I am doing compared with other students. | | **.792** | | .659 |

| Item # | Item | Factor Coefficients | | | Item-Total Correlation |
|---|---|---|---|---|---|
| | | Self-Efficacy | Test Anxiety | Task Value | |
| 5 | When I take a test I think about items on other parts of the test I can't answer. | | **.759** | | .605 |
| 8 | When I take tests I think of the consequences of failing. | | **.717** | | .576 |
| 14 | I think the course material in this class is useful for me to learn. | | | **-.913** | .879 |
| 16 | Understanding the subject matter of this course is very important to me. | | | **-.899** | .840 |
| 10 | I am very interested in the content area of this course. | | | **-.875** | .878 |
| 15 | I like the subject matter of this course. | | | **-.861** | .811 |
| 6 | It is important for me to learn the course material in this class. | | | **-.824** | .809 |
| 2 | I think I will be able to use what I learn in this course in other courses. | | | **-.824** | .787 |
| | Internal Consistency Cronbach's α | 0.947 | 0.846 | 0.945 | |

2. Learning Strategies Subscale of Modified MSLQ

Using the Kaiser-Guttman retention criterion of eigenvalues greater than 1.0, a five-factor solution provided the clearest extraction for the Learning Strategies Subscale of the Modified MSLQ. These five factors accounted for 56.414% of the total variance. Most of the items fell into the same structure as the original research. Communities were fairly high for each of the 31 items, with a range of 0.327 to 0.733. However, the last factor only contained two items, item #15 and item #1. Also, the both factor analysis and reliability results indicated that Item #29 was cross loading and led to decrease the reliability in the subscale. Therefore, these three items were deleted. The final Learning Strategies Subscale included four factors, with 52.767% of total variance explained and had 28 items. The first factor, Elaboration (eigenvalue=9.776), accounted for 31.535% of the variance and had eight items. The second factor, Time Management (eigenvalue=3.507), accounted for 11.314% of the variance and had seven items. The third factor, Metacognitive and Self-Regulatory (eigenvalue=1.646), accounted for 5.308% of the variance and had eight items. The final factor, Critical thinking (eigenvalue=1.429), accounted for 4.611% of the variance and had five items. The corrected item-total correlation ranged from 0.523 to 0.700 for the Elaboration, and Cronbach's coefficient alpha was 0.873, while corrected item-total correlation ranged from 0.491 to 0.619 for the Time Management, and Cronbach's coefficient alpha was 0.818. The corrected item-total correlation ranged from 0.446 to 0.629 for the Metacognitive and Self-Regulatory, and Cronbach's coefficient alpha was 0.813, whereas the corrected item-total correlation ranged from 0.572 to 0.793 for the Critical Thinking, and Cronbach's coefficient alpha was 0.837. Table 16 presents the items, the factors they

came from, their factor loadings, their item-total correlation, and their internal consistency Cronbach's alpha values.

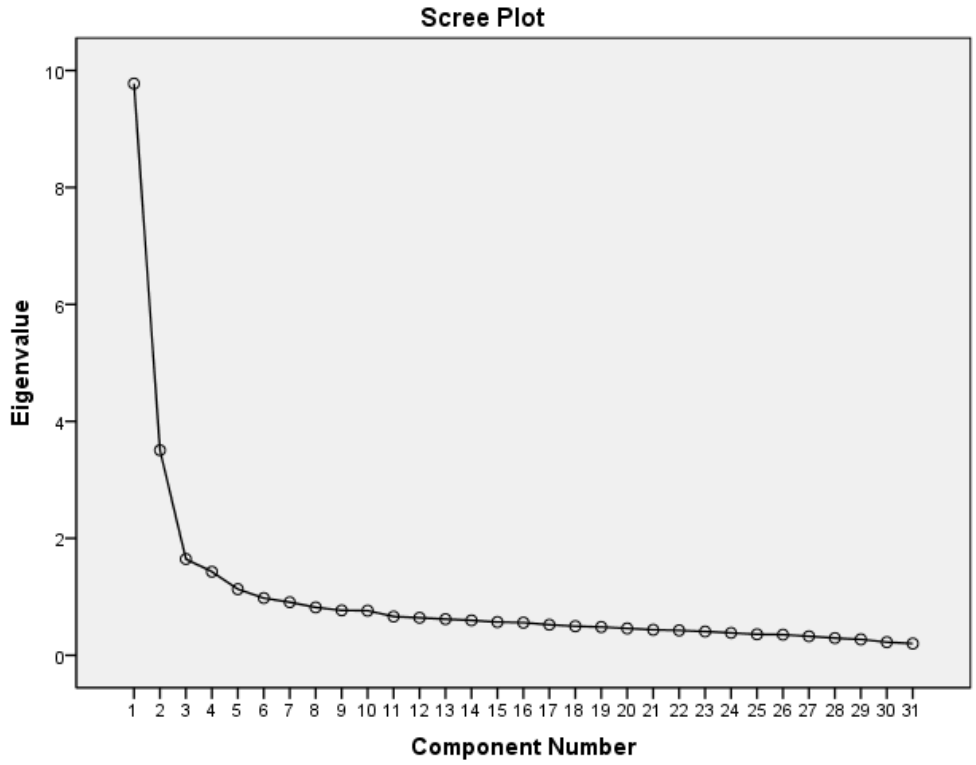


Figure 7 Scree plot for the Learning Strategies Subscale of the Modified MSLQ

Table 16

The Factor Analysis Results for the Learning Strategies Subscale of the Modified MSLQ

| Item # | Item | Factor Coefficients | | | | | Item-Total Correlation |
|---|---|---|---|---|---|---|---|
| | | Elaboration | Time Manage | Metacog. & Self-Regulation | Critical Think | 5 | |
| 18 | When reading for this class, I try to relate the material to what I already know. | **.814** | | | | | .697 |
| 5 | When I become confused about something I'm reading for this class, I go back and try to figure it out. | **.691** | | | | | .628 |
| 11 | When I study for this class, I pull together information from different sources, such as readings, online discussions, and my prior knowledge of the subject. | **.629** | | | | | .637 |
| 17 | I try to relate ideas in this subject to those in other courses whenever possible. | **.626** | | | | | .633 |
| 25 | I login to Blackboard/WebCT for this class regularly. | **.613** | | | | | .523 |
| 22 | I try to understand the material in this class by making connections between the readings and the concepts from the online activities. | **.565** | | -.304 | | | .700 |
| 26 | When studying for this course I try to determine which concepts I don't understand well. | **.478** | | | | | .632 |
| 31 | I try to apply ideas from course readings in other class activities such as online discussions. | **.470** | | | | | .633 |
| 29 | If I get confused during online activities, I make sure I sort it out afterwards. | .348 | | -.337 | | | |

| Item # | Item | Factor Coefficients | | | | | Item-Total Correlation |
|---|---|---|---|---|---|---|---|
| | | Elaboration | Time Manage | Metacog. & Self-Regulation | Critical Think | 5 | |
| 28r | I often find that I don't spend very much time on this course because of other activities. | | **.789** | | | | .617 |
| 10r | I find it hard to stick to a study schedule. | | **.777** | | | | .550 |
| 30r | I rarely find time to review my notes or readings. | | **.695** | | | | .527 |
| 23 | I make sure that I keep up with the weekly readings and assignments for this course. | | **.624** | | | | .619 |
| 6 | I make good use of my study time for this course. | | **.555** | | | | .596 |
| 19 | I have a regular place set aside for studying. | .312 | **.522** | | | | .521 |
| 2 | I usually study in a place where I can concentrate on my course work. | .365 | **.389** | | | | .491 |
| 3 | When reading for this course, I make up questions to help focus my reading. | | | **-.782** | | | .573 |
| 7 | If course readings are difficult to understand, I change the way I read the material. | | | **-.655** | | | .538 |
| 13 | I ask myself questions to make sure I understand the material I have been studying in this class. | | | **-.621** | | | .629 |
| 14 | I try to change the way I study in order to fit the course requirements and the instructional methods used in this class. | | | **-.588** | | | .448 |
| 27 | When I study for this class, I set goals for myself in order to direct my activities in each study. | | .330 | **-.566** | | | .580 |
| 21 | When I study for this course, I write brief | | | **-.471** | | | .446 |

| Item # | Item | Factor Coefficients | | | | | Item-Total Correlation |
|---|---|---|---|---|---|---|---|
| | | Elaboration | Time Manage | Metacog. & Self-Regulation | Critical Think | 5 | |
| | summaries of the main ideas from the readings and online discussions. | | | | | | |
| 12 | Before I study new course material thoroughly, I often skim it to see how it is organized. | | | **-.452** | | | .469 |
| 16 | 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 for this course. | | | **-.394** | .379 | | .585 |
| 24 | Whenever I read an assertion or conclusion in this class, I think about possible alternatives. | | | | **.808** | | .739 |
| 4 | I often find myself questioning things I hear or read in this course to decide if I find them convincing. | | | | **.790** | | .588 |
| 8 | When a theory, interpretation, or conclusion is presented in the online discussions or in the readings, I try to decide if there is good supporting evidence. | | | | **.669** | | .669 |
| 9 | I treat the course material as a starting point and try to develop my own ideas about it. | | | | **.627** | | .634 |
| 20 | I try to play around with ideas of my own related to what I am learning in this course. | .396 | | | **.519** | | .572 |
| 15r | I often find that I have been reading for this class but don't know what it was all about. | | | | | .774 | |
| 1r | While I'm online for this class I often miss important points because I'm thinking of other things. | | .415 | | | .572 | |
| | Internal Consistency Cronbach's α | 0.873 | 0.818 | 0.813 | 0.837 | | |

*Modified Self-Regulated Learning Interview Schedule*

This 4-item questionnaire was selected and modified from Zimmerman and Martinez-Pons' (1986) Self-Regulated Learning Interview Schedule (SRLIS). The original six Self-Regulated Learning Contexts questions were developed as a part of a structural interview questionnaire, Self-Regulated Learning Interview Schedule, to investigate students' self-regulated learning strategies in learning contexts (Zimmerman & Martinez-Pons, 1986). High school participants were given six learning contexts and decided among 14 self-regulated learning strategies, which strategies they used under each context. The 4 items in this questionnaire in the current study were used to recruit more information about students' learning strategies when they took online courses. The questions included:

1. What strategies do you use to keep up to date with assignments in this class?
2. What strategies do you use when trying to remember information from class/videos?
3. What strategies do you use when reviewing the materials available through the distance education site?
4. What online tools do you use most often and how are these helpful?"

*Online Technologies Self-Efficacy Scale (OTSES)*

The OTSES was designed by Miltiadou and Yu (2000) to measure technology self-efficacy of students who enrolled in online courses. The authors first constructed 40 items which included four content areas: internet competencies (e.g. opening a web browser), synchronous interaction (e.g. providing a nickname within a synchronous chat

system), asynchronous interaction I (e.g. logging on and off an e-mail system), and asynchronous interaction II (e.g. reading a message posted on an asynchronous conferencing system). The final instrument consisted of 29 4-point Likert type items. Participants were instructed to respond each item from "Not Confident At All" (1), "Not Very Confident" (2), "Somewhat Confident" (3), to "Very Confident" (4) based their level of confidence. The higher score represents the higher level of self-efficacy. The factor analysis results indicated that the instrument consisted of one factor, technology self-efficacy, and the internal consistency Cronbach's alpha equaled 0.95 for the entire instrument (Miltiadou & Yu, 2000).

An exploratory factor analysis using a principal component extraction method and an oblimin rotation of a 29-item self-report OTSES was administered to the participants at Auburn University (N=256). The Kaiser-Meyer-Olkin measure of sampling adequacy was 0.918, indicating that the present data were suitable for principal components analysis. Similarly, Bartlett's test of sphericity was significant ($p < 0.001$), indicating sufficient correlation between the variables to proceed with the analysis.

Using the Kaiser-Guttman retention criterion of eigenvalues greater than 1.0, a three-factor solution provided the clearest extraction accounting for 68.140% of the total variance. Communities were fairly high for each of the 31 items, with a range of 0.526 to 0.875. However, the last factor only consisted with two items, and these two items were cross loading in the second factor. In addition, the scree plot also suggested that there were two dominant factors (Figure 8). Therefore, two factors, the General Technology Self-Efficacy with 17 items, and the Online Learning Platform Technology Self-Efficacy with 12 items were obtained. For the General Technology Self-Efficacy, the corrected

item-total correlation was from 0.634 to 0.901, and Cronbach's coefficient alpha was 0.958, whereas for the Online Learning Platform Technology Self-Efficacy, the corrected item-total correlation was from 0.587 to 0.824, and Cronbach's coefficient alpha was 0.941. Table 17 presents the items, the factors they came from, their factor loadings, their item-total correlation, and their internal consistency Cronbach's alpha values.

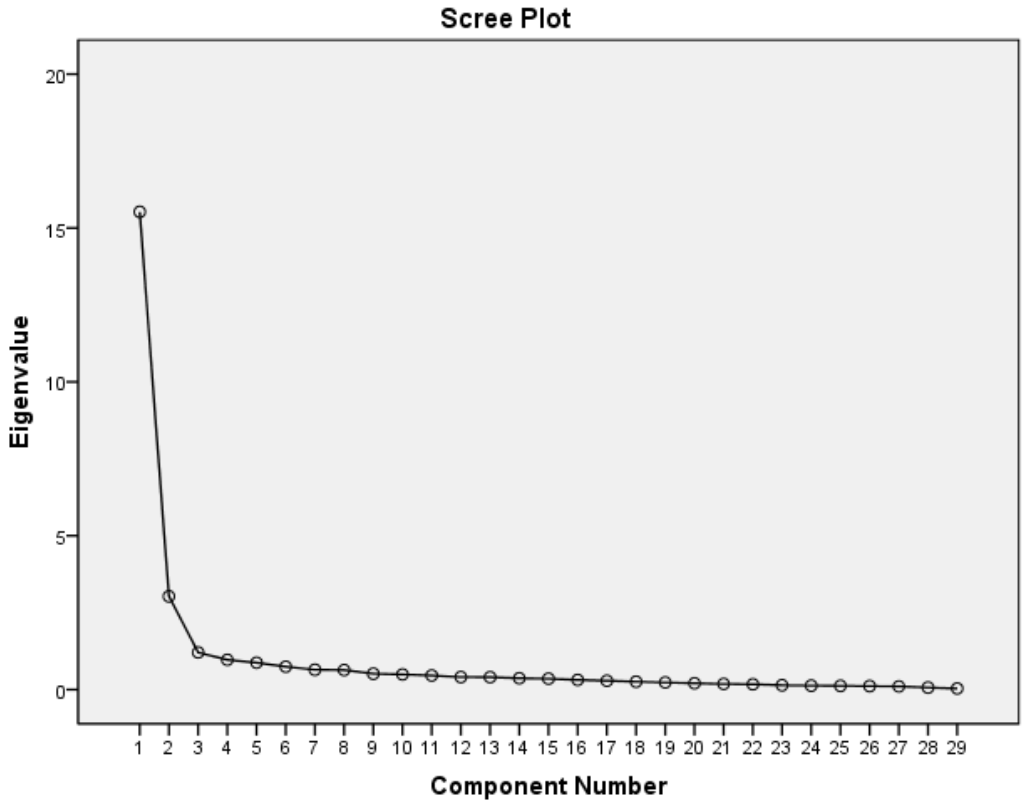


Figure 8 Scree plot for the Online Technologies Self-Efficacy Scale

*Demographic Questionnaire*

The demographic questions included: age, gender, academic status, education level, number of online courses taken, and the grade for the most recent online course.

Table 17

The Factor Analysis Results for Online Technologies Self-Efficacy Scale

| Item # | Item | Factor Coefficients | | | Item-Total Correlation |
|---|---|---|---|---|---|
| | | General | Online Platform | 3 | |
| 1 | Opening a web browser (e.g. Netscape or Explorer). | **.983** | | | .901 |
| 17 | Replying to an e-mail message. | **.898** | | | .804 |
| 4 | Accessing a specific web site by typing the address (URL). | **.878** | | | .889 |
| 2 | Reading text from a web site. | **.874** | | | .757 |
| 22 | Attaching a file (image or text) to an e-mail message and then sending it off. | **.873** | | | .794 |
| 15 | Sending an e-mail message to a specific person (one-to-one interaction). | **.871** | | | .817 |
| 18 | Forwarding an e-mail message. | **.856** | | | .818 |
| 7 | Conducting an Internet search using one or more keywords. | **.836** | | | .817 |
| 21 | Saving a file attached to an e-mail message to a local disk and then viewing the contents of that file. | **.760** | | | .741 |
| 3 | Clicking on a link to visit a specific web site. | **.760** | | | .797 |
| 16 | Sending one e-mail message to more than one person at the same time (one-to-many interaction). | **.745** | | | .786 |
| 8 | Downloading (saving) an image from a web site to a disk. | **.716** | | | .733 |

| Item # | Item | Factor Coefficients | | | Item-Total Correlation |
|---|---|---|---|---|---|
| | | General | Online Platform | 3 | |
| 19 | Deleting messages received via e-mail. | **.688** | | | .719 |
| 5 | Bookmarking a web site. | **.661** | | | .690 |
| 9 | Coping a block of text from a web site and pasting it to a document in a word processor. | **.606** | | -.348 | .643 |
| 6 | Printing a web site. | **.476** | | | .654 |
| 14 | Loading on and off an e-mail system. | **.448** | | | .634 |
| 26 | Replying to a message posted on an asynchronous conferencing system so that all members can view it. | | **.916** | | .824 |
| 24 | Posting a new message to an synchronous conferencing system (creating a new thread). | | **.891** | | .735 |
| 12 | Answering a message or providing my own message in a synchronous chat system (one-to-many interaction). | | **.880** | | .785 |
| 11 | Reading messages from one or more members of the synchronous chat system. | | **.809** | | .769 |
| 23 | Signing on and off an asynchronous conferencing system. | | **.797** | | .793 |
| 13 | Interacting privately with one member of the synchronous chat system (one-to-one interaction). | | **.764** | | .690 |
| 10 | Providing a nickname within a synchronous chat system (if | | **.749** | | .752 |

| Item # | Item | Factor Coefficients | | | Item-Total Correlation |
|---|---|---|---|---|---|
| | | General | Online Platform | 3 | |
| | necessary). | | | | |
| 29 | Uploading (sending) a file to an asynchronous conferencing system. | | **.680** | .353 | .775 |
| 27 | Replying to a message posted on an asynchronous conferencing system so that only one member can view it (reply to sender). | | **.620** | .341 | .733 |
| 25 | Reading a message posted on an asynchronous conferencing system. | .419 | **.479** | | .719 |
| 28 | Downloading (saving) a file from an asynchronous conferencing system to a local disk. | .302 | **.316** | .547 | .648 |
| 20 | Creating an address book. | | **.356** | .438 | .587 |
| | Internal Consistency Cronbach's α | 0.958 | 0.941 | | |

## Statistical Method

The Statistical Package for Social Science (SPSS) 18.0 and AMOS 18.0 were used as the statistical software to analyze the data, while covariance-based structural equation modeling (SEM) was used to examine the hypothesized model and answer the research questions.

Structural Equation Modeling (SEM), also known as causal modeling, is a multivariate technique which was first introduced by Karl Joreskog in 1970 (Klem, 2000). It is an extension of General Linear Model (Garson, 2009). It represents two statistical traditions, psychometric and econometrics. For the psychometric origins, it focuses on the relationship between factors and a construct. For econometrics origins, it emphasizes on understanding the interdependence among economic variables based on path analysis (Kaplan, 2000). Therefore, it can be considered as a combination of factor analysis and path analysis (Garson, 2009; Tabachnick & Fidell, 2007), and consists of two parts: the measurement part and the structural part. The measurement part tries to link the relationship between observed variables and latent variables by a confirmatory factor analysis, whereas the structural part links the relationship among latent variables simultaneously (Kaplan, 2000). It is usually used for hypothesized model testing. Therefore, an effort to generate a hypothesized model based on strong theoretical background is recommended.

Conducting a structural equation modeling is based on a "conventional" practice (Kaplan, 2000). A theory is presented at the beginning, and based on the theory, a model is specified. Next, measurement is done based on the selected sample. Next, based on the

data collected, parameter is estimated. Followed by estimation, the researcher should assess the model fit. If it does not fit well, a model modification is needed, and parameter is estimated again, until obtaining an appropriate model to explain the sample phenomenon (Kaplan, 2000; see Figure 9).

Structural Equation Modeling is very similar to path analysis, except path analysis focuses on the relationship among observed variables while the SEM focuses on the relationship among latent variables. Path analysis can be used to examine the mediator effect and provides causality inference (Meyers, Gamst & Guarino, 2006). In addition to the strength of path analysis and examine the relationship among latent variables, SEM can also construct the relationship between latent variables and observed variables at the same time. It can also provide a more powerful test of causal relationships of the hypothesis model, and its measures are more valid and reliable (Rigdon, 1998; Gall, Gall & Borg, 2003; Hair, Black, Babin, Anderson & Tatham, 2006; Hsu, Chen & Hsieh, 2006).

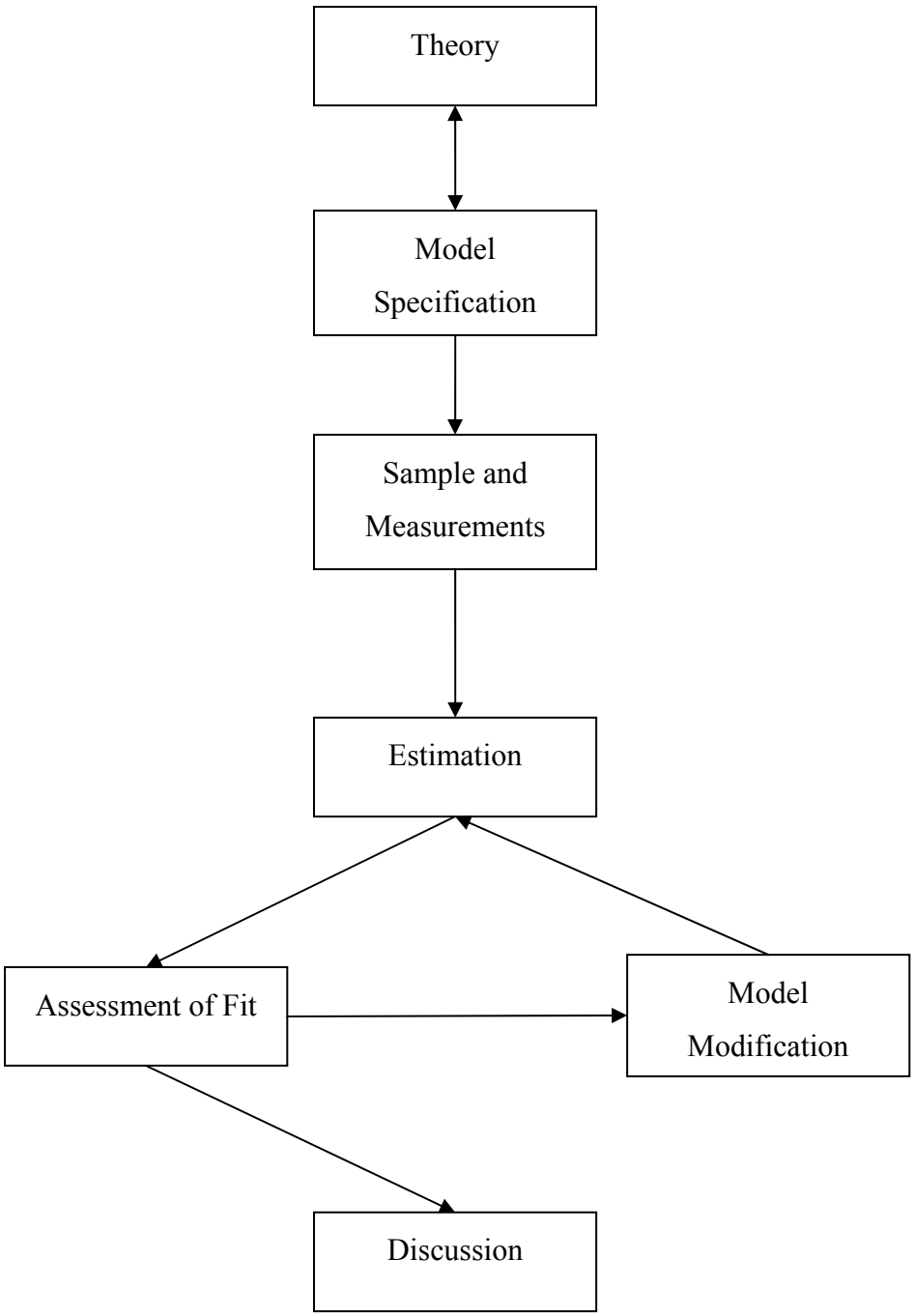


Figure 9 Diagram of conventional approach to structural equation modeling (Adapted from Kaplan, 2000, p. 8)

*Components of a Structural Equation Modeling*

A structural equation modeling includes three major components: observed variables (or called indicators, manifest variables), latent variables (or called constructs, concepts), and path relationships (include one-way, two-way, and correlational paths).

Latent variables are usually represented in a circle. A latent variable is a construct variable that cannot be observed or measured directly, such as self-regulated learning, and self-efficacy. An exogenous variable (Students' Characteristics in Figure 1) is a construct variable which can explain other latent variables, while an endogenous variable (Self-regulated Learning and Course Outcomes in Figure 1) is a construct which can be explained by others. The endogenous variables can be considered to be equivalent to dependent variables, whereas the exogenous variables are equivalent of independent variables (Hair et al., 2006; Meyers et al., 2006). In the hypothesized model of the current study, Students' Characteristics was the exogenous variable, while Self-Regulated Learning, Technology Self-Efficacy, and the Course Oucomes were endogenous variables.

Observed variables (or indicators, manifest variables) are represented by a square shape. They are measured to represent constructs, such as Gender, Educational Level, Previous Online Courses Have Taken, Motivation, Learning Strategies, Course Satisfaction, and Achievement. The path relationship includes the relationship between the latent variable and the observed variable it explained, the relationship between the exogenous latent variable and endogenous latent, and the relationship among endogenous latent variables.

*Model Identification*

In structural equation modeling, identification problems need to be resolved prior to the estimation of parameters (Schumacker & Lomax, 2004). Identification problem refers to when the parameter cannot be estimated uniquely by the sample data (Kaplan, 2000). This problem occurs when there are not enough constraints on the model and the data to obtain unique estimates of parameter. In other words, there are not enough degrees of freedom to estimate the parameters. Therefore, the way to solve this problem is to impose some constraints. Usually, researcher fixes the factor loading of one observed variable of each latent variable to be 1, or sets the variance of each latent variable to be 1.

*Assumptions for SEM*

Covariance-based SEM requires the following assumptions (Tabachnick & Fidell, 2007):

(1) The data must be multivariate normality because of the parameter estimation methods.

(2) There are linear relationships between observed variables and their corresponding latent variables. Also, there are linear relationships among latent variables.

(3) Absence of multicollinearity and singularity.

*Conducting a Covariance-based SEM*

A covariance-based SEM focuses on understanding the relationship among the latent variables, and the relationship between latent variable and its observed variables.

Therefore, it is parameter oriented, and the model is heavily dependent on theoretical foundations. A covariance-based SEM uses Maximum Likelihood Estimation (MLE) or Generalized Least Squares (GLS) procedure to estimate the parameters. These procedures estimate the parameters by minimizing the difference between observed and predicted covariance matrices of the observed variables. Therefore, the multivariate normality, linearity, and non-singularity in the dataset assumptions have to be met in order to obtain reliable and consistent estimators. Based on this procedure, the values of latent variables are indeterminate. A large sample size is usually required for a covariance-based SEM. However, as the sample size increases, the goodness-of-fit test becomes very sensitive and indicates poor fit (Marsh, Balla & McDonald, 1988; Tanaka, 1987). Therefore, other fit indices are required during evaluating the model fit. As for the sample size, ten times the total number of observed variables is recommended, but 200 is proposed as the "critical sample size" (Hoelter, 1983).

*Assessment of Model Fit*

After obtaining the parameter estimations, the next step is evaluating the fitting criteria. Three types of fit measures are used in covariance-based SEM, absolute, relative and parsimonious (Meyers et al., 2006).

The absolute fit measures indicate how well the covariance matrix of hypothesized model fits the covariance matrix of the actual data. The absolute fit measures include Goodness-of-fit test (Chi-square statistic, $\chi^2$), goodness-of-fit index (GFI), and root mean square error of approximation (RMSEA). Among these indices, $\chi^2$ is the only statistical testing index in SEM. The researcher is expecting a good model fit,

therefore, a non statistical significance in Chi-square test is desired, whereas the ratio of Chi-square and degrees of freedom should be less than two. A significant $\chi^2$ indicates that there is a difference between the predicted and observed covariance matrices. However, the Chi-square test is very sensitive to sample size. A larger sample size usually leads to statistical significance very easily. Therefore, one cannot rely solely on the significance of the Chi-square test when the sample size is large. The researchers need to take other fit indices into consideration. The GFI is the percent of observed covariance accounted for by the predicted model. It is also larger when the sample size is large. Usually, GFI should be equal to or larger than 0.90 to indicate a good model fit. RMSEA is the average of the residuals between the observed covariance and the expected model. It should be smaller than 0.08 in order to reach a good model fit. If RMSEA is larger than 0.1, the model is not acceptable.

The relative fit measures are assessing the fit between the null model (assumed that there are no relationships in the data), and the saturated model (assumed that there is a perfect fit between the data and the model). These measures include comparative fit index (CFI), and normed fit index (NFI) and are expected to be larger than 0.9.

Parsimonious fit measures are also known as adjusted fit measures. The adjusted goodness-of-fit (AGFI) and the parsimonious goodness-of-fit (PGFI) are commonly used to compare the models with different numbers of parameters by considering the degrees of freedom. Ideally, values larger than 0.9 indicate an acceptable model.

The general "rule of thumb" for the cut-off value of fit measures is 0.90 for GFI, CFI, NFI, and 0.1 for RMSEA. However, Bullman (2007), Meyers et al. (2006), and Schreiber, Stage, King, Nora, and Barlow (2006) suggested that only when NFI, CFI, and

GFI are larger than 0.95 and RMSEA is less than 0.08, the model can be considered to exhibit good fit. On the other hand, Hu and Bentler (1999) further suggested that RMSEA should be less than 0.06. Hair et al. (2006) provided a more sophisticated guideline in which the cutoff point was based on the number of variables and the number of participants. The general rules are the more variables the model has, the smaller CFI cutoff point is, whereas the more participants the data has, the smaller the RMSEA cutoff point is (Table 18).

Table 18

Characteristics of Different Fit Indices Demonstrating Goodness-of-Fit across Different Model Situations (Modified from Hair et al., 2006, pp. 753)

| | N<250 | | | N>250 | | |
|---|---|---|---|---|---|---|
| Stat | Vars≤12 | 12~30 | Vars≥30 | Vars≤12 | 12~30 | Vars≥30 |
| $\chi^2$ | Insignificant *p*-values expected | Significant *p*-values can result even with good fit | Significant *p*-values can be expected | Insignificant *p*-values can result with good fit | Significant *p*-values can be expected | Significant *p*-values can be expected |
| CFI | 0.97 or better | 0.95 or better | Above 0.92 | 0.95 or better | Above 0.92 | Above 0.90 |
| SRMR | Could be biased upward, use other indices | 0.08 or less | Less than 0.09 | Could be biased upward, use other indices | 0.08 or less | 0.08 or less |
| RMSEA | Values < 0.08 | Values < 0.08 | Values <0.08 | Values <0.07 | Values <0.07 | Values <0.07 |

*Advantage in Using SEM*

There are some advantages in using SEM. Theoretically, it allows researchers draw causality inference even though it is a quasi-experimental research design (Meyers et al., 2006). However, SEM is not only used in analyzing quasi-experimental data, it also can be used in analyzing experimental data (Tabachnick & Fidell, 2007). Statistically, when the relationships among factors are examined, the measurement error is also estimated and minimized. In addition, by estimating and removing the measurement error, the measurement can be considered as reliable. Further, SEM can be used to examine the mediator processes, and the contribution of mediators is explicitly included in the analysis results. Finally, SEM can be used to analyze complex models, and examine the relationships among factors simultaneously. In fact, if the hypothesized models are complex and multidimensional, SEM is the only analysis that is appropriate (Tabachnick & Fidell, 2007).

*Limitations to SEM*

SEM is a confirmatory technique (Tabachnick & Fidell, 2007). Therefore, it is important to have a theory-based hypothesized model to examine the relationship among the factors in the model. Therefore, when we conduct a SEM, researchers should have prior knowledge about research-related theories and plan ahead.

A researcher can modify his/her model in order to obtain a better fit. However, too many modifications lead to risk the Type I error. Therefore, the results should be

viewed cautiously, and if it is possible, perform cross-validation with another sample (Tabachnick & Fidell, 2007).

Although some researchers claimed that SEM can be used for causality inference, some researchers have a different opinion. They argue that causality should be a research issue, not a statistical issue (Tabachnick & Fidell, 2007). Therefore, based on the results from SEM, causality inferences cannot be drawn unless the research design provides necessary and sufficient information for researcher to make the conclusion.

This research sought to answer the following questions by using SEM:

*Research Question 1: Overall, can the hypothesized model explain the relationship among students' characteristics, self-regulated learning (motivation and learning strategies), technology self-efficacy, and course outcomes (achievement and course satisfaction) in online learning settings?*

In order to answer research question 1, the $\chi 2$ and model fit indices were used to determine if the data fit the hypothesis model. The cutoff points are 0.90 for GFI, CFI, NFI, and 0.08 for RMSEA.

*Research Question 2: Do students' characteristics influence self-regulated learning, technology self-efficacy, and course outcomes (achievement, and satisfaction) in online learning settings?*

The significance of path coefficients between students' characteristics and self-regulated learning (Path 1, Figure 10), students' characteristics and technology self-

efficacy (Path 2), and students' characteristics and course outcomes (Path 6) were used to determine their relationships. Students' characteristics represent the exogenous variables, while self-regulated learning, technology self-efficacy, and course outcomes are endogenous variables in current study. Since these variables are latent variables and cannot be observed, factor analysis was performed for the each scale to obtain the observed variables for each latent variable. In addition, to determine internal consistency Cronbach's alpha was also performed to determine the reliability of each factor.

*Research Question 3: A. Does students' self-regulated learning influence the course outcomes in online learning settings? B. Does students' technology self-efficacy influence the course outcomes in online learning settings? C. Do students' self-regulated learning and technology self-efficacy interact with each other?*

Similar to Research Question 1, the significance of path coefficients are used to determine the relations between self-regulated learning and course outcomes (Path 4), technology self-efficacy and course outcomes (Path 5), and self-regulated learning and technology self-efficacy (Path 3).

*Research Question 4: Are self-regulated learning and technology self-efficacy mediators between students' characteristics, and the course outcomes?*

A variable can be considered as a mediator when: (1) it is influenced by the independent variable (exogenous), (2) it influences the dependent variable (endogenous), and (3) there is no statistically significant or only a small relationship between independent and dependent variables (Neu, 2000). Therefore, if the path coefficient

between students' characteristics and course outcomes (Path 6) does not reach statistical significance, and other path coefficients are statistically significant, or the path coefficients between students' characteristics and course outcomes reach statistical significant but are smaller than other path coefficients, then, the research hypothesis is supported.

## Summary

In order to determine the relationship among students' characteristics, self-regulated learning, technology self-efficacy, and course outcomes in online learning settings, students at Auburn University enrolled in online courses during 2008-2009 academic year were invited to participate in the current study. The Students' demographic information, the characteristics questionnaire, the Modified Motivation Strategies for Learning Questionnaire, the Open-ended Learning Strategies Questionnaire, the Online Technology Self-Efficacy Scale, the Course Satisfaction Questionnaire, and the final grades were the instruments used to collect data.

The survey was distributed via Auburn University e-Mail system. The final data consisted of 256 participants. Factor analysis results suggested one factor for the Course Satisfaction Questionnaire, three factors for the Motivation Subscale of the Modified MSLQ, four factors for the Learning Strategies Subscale of the Modified MSLQ, and two factors for the Online Technology Self-Efficacy Scale. The results were similar to the previous research. Internal consistency Cronbach's alpha suggested that these instruments yield highly reliable scores. Structural Equation Modeling was the major statistical technique used to analyze the data and answer the research questions.

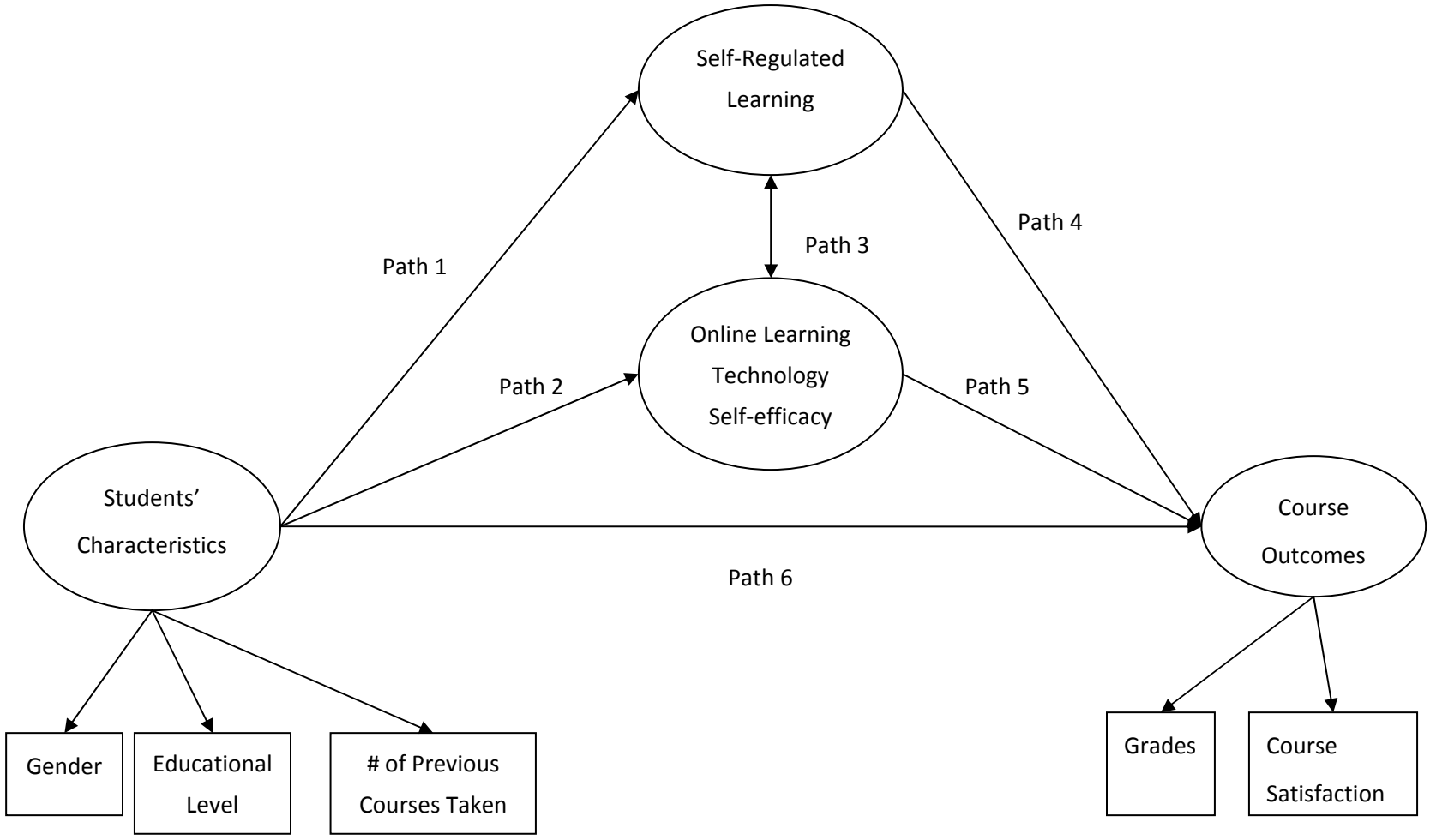


Figure 10. Hypothesized model with path number

# IV. RESULTS

The purpose of this study was to examine the relationships among student's characteristics, self-regulated learning, technology self-efficacy, and course outcomes simultaneously in order to provide an overall view. A hypothesized model was generated based on previous studies. The research questions for current study were:

(1) Overall, can the hypothesized model explain the relationship among students' characteristics and previous online learning experiences, self-regulated learning (motivation and learning strategies), technology self-efficacy, and course outcomes (achievement and course satisfaction) in online learning settings?

(2) Do students' characteristics and previous online learning experiences influence self-regulated learning, technology self-efficacy, and course outcomes (achievement, and satisfaction) in online learning settings?

(3) A. Does students' self-regulated learning influence the course outcomes in online learning settings?

B. Does students' technology self-efficacy influence the course outcomes in online learning settings?

C. Do students' self-regulated learning and technology self-efficacy interact with each other?

(4) Are self-regulated learning and technology self-efficacy mediators between students' characteristics, and the course outcomes?

In order to answer these research questions, a Demographic Questionnaire, a Course Satisfaction Questionnaire (CSQ), a Modified Motivation Strategies for Learning Questionnaire (Modified MSLQ), and an Online Technology Self-Efficacy Scale (OTSES) were used as the instruments in current study. The instruments were administered by SurveyMonkey.com. All data were collected anonymously. Because the survey in the current study consisted of a total of 130 items, a Latin Square Design was used to generate seven different forms of the instrument with the same items in a different order to avoid response sets and eliminate system error. All 2139 potential participants were randomly assigned to seven groups. Each group received one type of survey form. All groups had a similar combination of graduate and undergraduate students, as well as males and females. Two hundred and fifty-sixty participants completed the survey with a response rate at 12.05%. The returned responses consisted of 121 males and 135 females, whereas 95 participants were graduate students and 161 of them were undergraduate students.

## Quantitative Research Results

The Statistical Package for Social Science (SPSS) 17.0 and AMOS 17.0 were used as the statistical software to analyze the data, while covariance-based structural equation modeling (SEM) with maximum likelihood estimation was used to examine the hypothesized model and answer the research questions. The AMOS program provided indices in terms of determining the model fit of SEM. These indices included the

Goodness-of-fit test (Chi-square statistic, $\chi^2$), the goodness-of-fit index (GFI), the comparative fit index (CFI), the normed fit index (NFI), and the root mean square error of approximation (RMSEA). Usually, the Chi-square is expected to be non-significant to indicate a better model fit. However, Chi-square is very sensitive to sample size. Therefore, other fit indices were used for further model evaluation. The general "rule of thumb" for cut-off values of fit measures is 0.90 for GFI, CFI, NFI, and 0.08 for RMSEA.

*Descriptive Statistics and Assumptions*

Descriptive statistics for all variables are shown on Table 19. The mean for the Motivation Subscale of the Modified MSLQ for the sample was 100.137 with a standard deviation of 16.733. For the Learning Strategies Subscale of the Modified MSLQ, the mean was 138.770 with a standard deviation of 24.558. The Online Technology Self-Efficacy Scale yielded a mean of 111.461 with a standard deviation of 9.427, whereas the Course Satisfaction Questionnaire yielded a mean of 116.004 with a standard deviation of 24.817. The average of final scores for the most recent online course was 3.7 with a standard deviation of 0.63.

The Bivariate correlation Pearson correlation coefficients were computed to investigate the linearity between the indicator variables and their latent variables, and among the latent variables (Table 20). The correlation coefficients between each indicator and its latent variable ranged from 0.397 to 0.926, indicating that the linearity assumption between indicator and latent variables was not violated. In addition, the correlation coefficients among latent variables ranged from 0.288 to 0.659, indicating that there was

a linear relationship among latent variables. Further, the correlation coefficients among indicators are ranged from 0.034 to 0.736, indicating a small possibility of multicollinearity and singularity of the covariance matrix. However, based on the results of normality assessment in AMOS, the multivariate normality assumption is violated (kurtosis=89.720, critical ratio=33.911). Therefore, Bollen-Stine bootstrap method is suggested to be used for inference of exact structural model (Garson, 2009).

Table 19

Descriptive Statistics for All Variables (N=256)

| Measure | M | Std |
|---|---|---|
| Motivation | 100.137 | 16.733 |
| Self-Efficacy | 46.828 | 8.590 |
| Test Anxiety | 18.387 | 7.660 |
| Task Value | 34.922 | 7.191 |
| Learning Strategies | 138.770 | 24.558 |
| Elaboration | 44.606 | 8.222 |
| Time Management | 35.090 | 7.921 |
| Self-Regulated Learning and Metacognition | 35.813 | 8.957 |
| Critical Thinking | 23.262 | 6.125 |
| Technology Self-efficacy | 111.461 | 9.427 |
| General | 66.344 | 4.961 |
| Online | 45.117 | 5.278 |
| Course Satisfaction | 116.004 | 24.817 |
| Performance | 3.668 | .677 |

Table 20

Correlation Matrix of Indicators and Latent Variables

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. Previous Courses | 1 | | | | | | | | | | | | | | | |
| 2. Motivation | .219** | 1 | | | | | | | | | | | | | | |
| 3. Self-Efficacy | .167** | .814** | 1 | | | | | | | | | | | | | |
| 4. Test Anxiety | .080 | .477** | -.034 | 1 | | | | | | | | | | | | |
| 5. Task Value | .226** | .847** | .736** | .086 | 1 | | | | | | | | | | | |
| 6. Learning Strategies | .212** | .659** | .566** | .146* | .702** | 1 | | | | | | | | | | |
| 7. Elaboration | .222** | .682** | .601** | .142* | .717** | .872** | 1 | | | | | | | | | |
| 8. Time Management | .087 | .347** | .355** | -.082 | .470** | .655** | .419** | 1 | | | | | | | | |
| 9. Metacog. & Self-Regulatory | .163** | .548** | .391** | .257** | .534** | .853** | .661** | .381** | 1 | | | | | | | |
| 10. Critical Thinking | .200** | .476** | .430** | .123* | .464** | .745** | .646** | .214** | .576** | 1 | | | | | | |
| 11. Technology Self-Efficacy | .169** | .311** | .385** | -.072 | .341** | .288** | .367** | .148* | .212** | .161* | 1 | | | | | |
| 12. General | .120 | .286** | .356** | -.063 | .308** | .237** | .320** | .101 | .177** | .132* | .915** | 1 | | | | |
| 13. Online | .188** | .287** | .353** | -.068 | .319** | .291** | .354** | .169** | .212** | .163** | .926** | .695** | 1 | | | |
| 14. Course Outcomes | .098 | .472** | .483** | -.040 | .565** | .491** | .504** | .309** | .401** | .306** | .301** | .276** | .279** | 1 | | |
| 15. Course Satisfaction | .095 | .472** | .480** | -.037 | .564** | .489** | .502** | .305** | .402** | .305** | .297** | .271** | .276** | 1.000** | 1 | |
| 16. Performance | .151* | .192** | .288** | -.128* | .238** | .267** | .275** | .270** | .129* | .166** | .255** | .274** | .199** | .397** | .373** | 1 |

**. Correlation is significant at the 0.01 level (2-tailed). *. Correlation is significant at the 0.05 level (2-tailed).

*Hypothesized Model*

Analysis of the hypothesized model indicated an unacceptable fit between the hypothesis model and the observed data (Figure 11). The Chi-square test was statistically significant ($\chi^2 = 232.936, df = 71, p < 0.001$), and the GFI, the CFI, and the NFI values were 0.880, 0.868, and 0.823, respectively, indicating a relatively poor fit. The RMSEA yielded a value of 0.095, indicating a moderate fit of the model. Overall, the model was not acceptable. Not all the path coefficient demonstrated statistical significance ($p < 0.05$) and practical significance ($\beta > 0.3$) (Table 21).

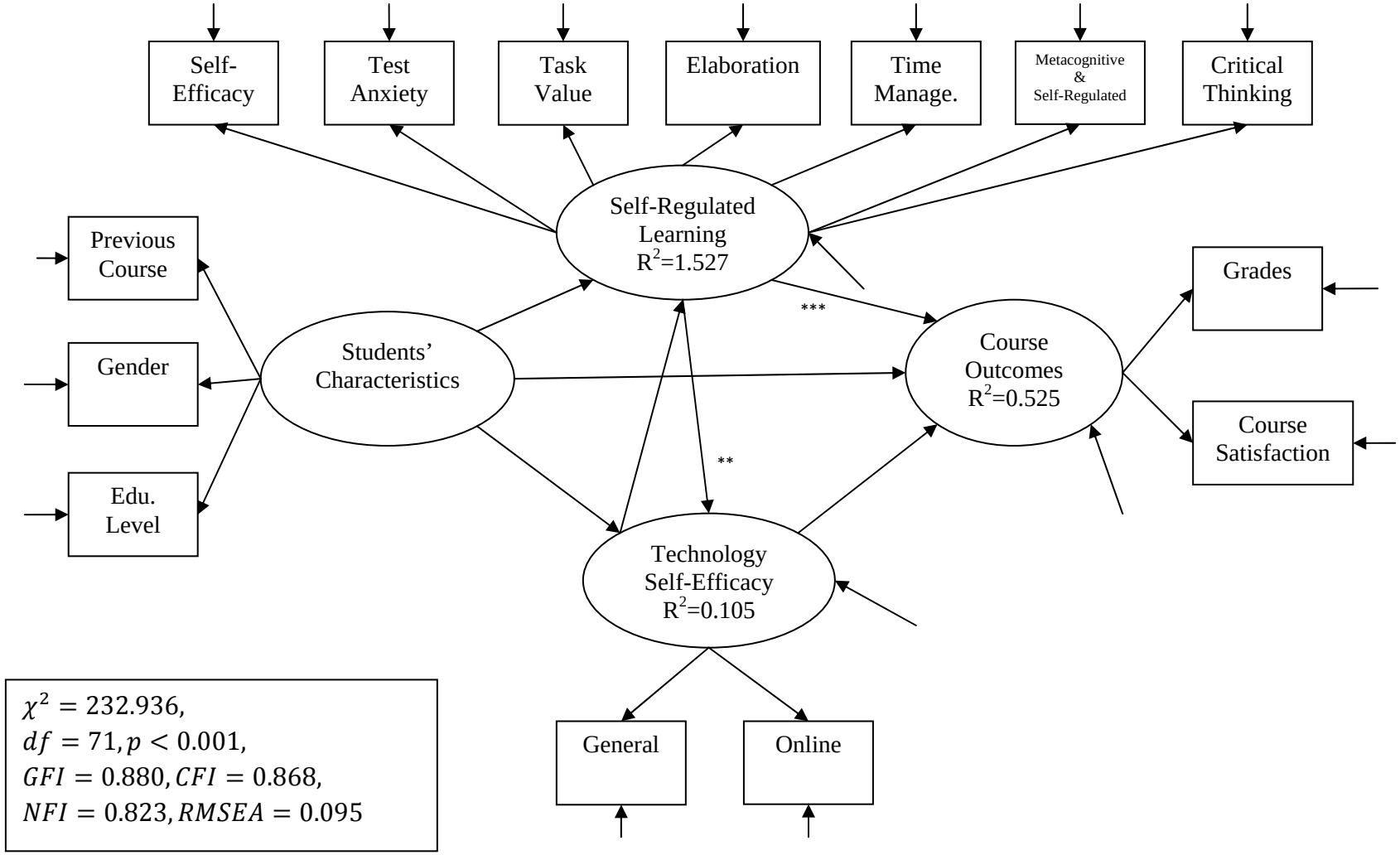


Figure 11 Results for Hypothesized Model

Table 21

The Estimation for Regression Weights of Hypothesized Model

| | | Estimate | S.E. | C.R. | P | Standardized Coefficient |
|---|---|---|---|---|---|---|
| SRL | <--- characteristics | 1.000 | | | | .507 |
| Tech SE | <--- characteristics | .020 | .204 | .099 | .921 | .014 |
| OUTCOMES | <--- characteristics | -.007 | .009 | -.787 | .432 | -.072 |
| OUTCOMES | <--- SRL | .032 | .007 | 4.664 | *** | .675 |
| OUTCOMES | <--- Tech SE | .008 | .005 | 1.597 | .110 | .130 |
| Self-Efficacy | <--- SRL | 1.000 | | | | .740 |
| Test Anxiety | <--- SRL | .132 | .079 | 1.664 | .096 | .109 |
| Task Value | <--- SRL | .960 | .071 | 13.442 | *** | .849 |
| Elaboration | <--- SRL | 1.132 | .082 | 13.833 | *** | .875 |
| Time Manage | <--- SRL | .618 | .081 | 7.657 | *** | .496 |
| Metacog. | <--- SRL | .971 | .090 | 10.805 | *** | .689 |
| Critical Think | <--- SRL | .620 | .062 | 10.049 | *** | .643 |
| Online_tech | <--- Tech SE | 1.000 | | | | .871 |
| General_tech | <--- Tech SE | .861 | .112 | 7.664 | *** | .798 |
| # of Course | <--- characteristics | 1.000 | | | | .652 |
| Edu. Level | <--- characteristics | .073 | .026 | 2.762 | .006 | .485 |
| Gender | <--- characteristics | -.037 | .016 | -2.300 | .021 | -.241 |
| Grade | <--- OUTCOMES | 1.000 | | | | .443 |
| CSQ | <--- OUTCOMES | 69.661 | 13.428 | 5.188 | *** | .842 |
| Tech SE | <--- SRL | .711 | .268 | 2.653 | .008 | .982 |
| SRL | <--- Tech SE | -1.338 | 1.054 | -1.270 | .204 | -.968 |

*Re-specified Model 1*

After deleting non-significant path coefficients one by one according to its *p*-value, Figure 12 represents the Re-specified Model 1. The results still indicated an unacceptable fit between the hypothesis model and the observed data. The Chi-square test was statistically significant ($\chi^2 = 197.613, df = 62, p < 0.001$), and the GFI, the CFI, and the NFI values were 0.893, 0.887, and 0.845, respectively, indicating a relatively poor fit. The RMSEA yielded a value of 0.093, indicating a moderate fit of the model.

Overall, the model was not acceptable. All the path coefficients demonstrated statistical significance ($p < 0.05$) or practical significance ($\beta > 0.3$) (Table 22). In order to assess the accuracy of the prediction in the structural equations, the proportion of variance accounted for ($R^2$) was examined. In the Re-specified Model 1, a strong effect size was reported for the endogenous variable of the Course Outcomes ($R^2 = 0.512$).

Table 22

The Estimation for Regression Weights of Re-specified Model 1

| | | | Estimate | S.E. | C.R. | P | Standardized Coefficient |
|---|---|---|---|---|---|---|---|
| SRL | <--- | characteristics | .513 | .232 | 2.208 | .027 | .257 |
| OUTCOMES | <--- | SRL | .033 | .007 | 4.813 | *** | .716 |
| Tech SE | <--- | SRL | .322 | .054 | 6.014 | *** | .451 |
| Self-Efficacy | <--- | SRL | 1.000 | | | | .745 |
| Task Value | <--- | SRL | .956 | .070 | 13.636 | *** | .851 |
| Elaboration | <--- | SRL | 1.118 | .080 | 13.935 | *** | .871 |
| Time Manage | <--- | SRL | .615 | .080 | 7.708 | *** | .497 |
| Metacog. | <--- | SRL | .955 | .089 | 10.775 | *** | .683 |
| Critical Think | <--- | SRL | .610 | .061 | 10.019 | *** | .638 |
| Online_tech | <--- | Tech SE | 1.000 | | | | .867 |
| General_tech | <--- | Tech SE | .870 | .120 | 7.278 | *** | .802 |
| # of Course | <--- | characteristics | 1.000 | | | | .649 |
| Edu. Level | <--- | characteristics | .074 | .029 | 2.509 | .012 | .489 |
| Gender | <--- | characteristics | -.037 | .017 | -2.197 | .028 | -.239 |
| Grade | <--- | OUTCOMES | 1.000 | | | | .440 |
| CSQ | <--- | OUTCOMES | 70.808 | 13.928 | 5.084 | *** | .849 |

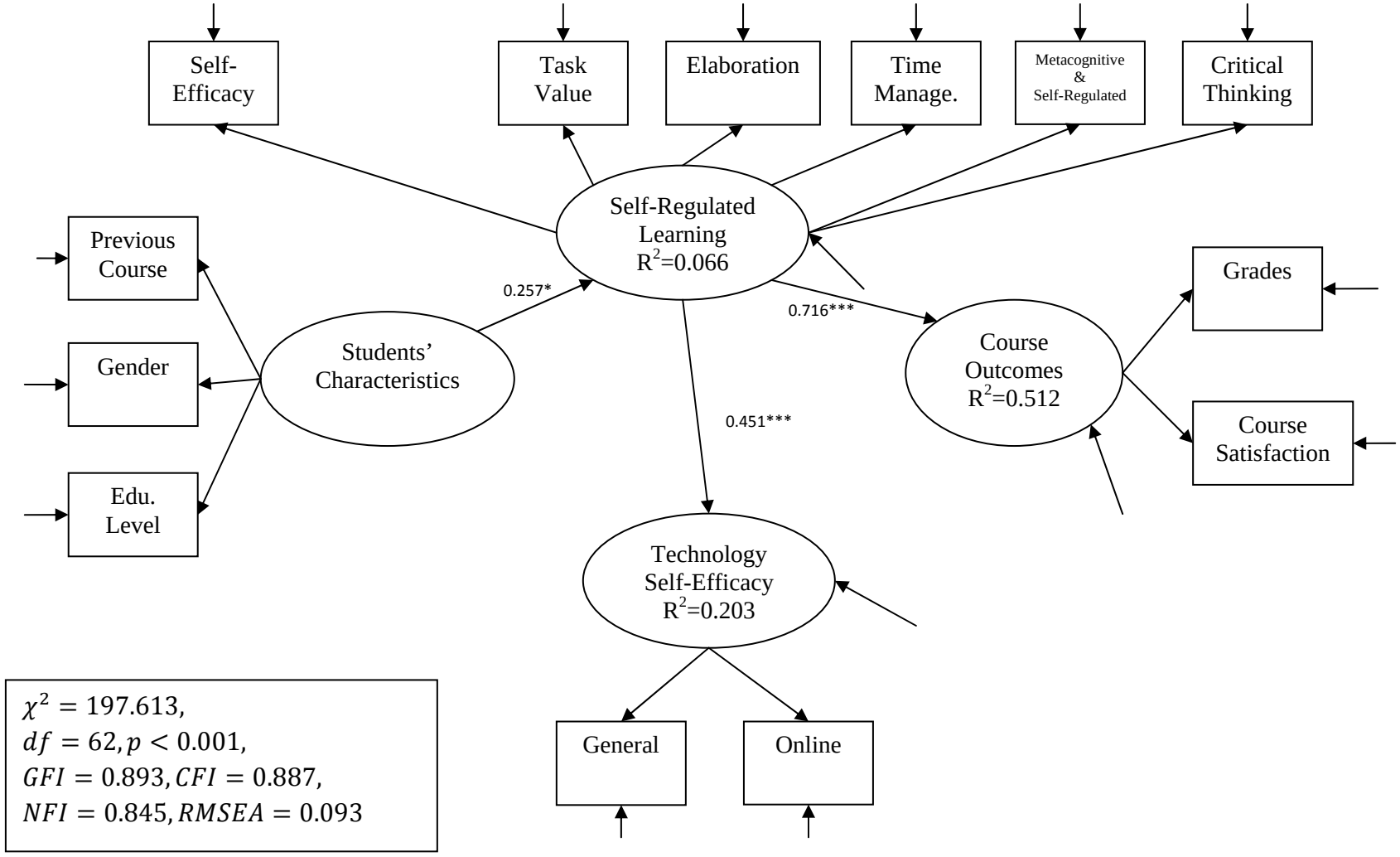


Figure 12 Results for Re-specified Model 1

*Re-specified Model 2*

According to Pintrich, Smith, Garcia and Mckeachie (1993), the development of MSLQ was based on general cognitive views of motivation and learning strategies. The motivation subscale was based on a general social-cognitive model of motivation, whereas the learning strategies subscale was based on a general cognitive model of learning and information processing. Therefore, the Modified MSLQ used in the current study can be considered as measuring two different constructs: motivation and learning strategies. In addition, Paechter et al. (2010) pointed out that learning achievement is the cognitive dimension of a course outcome, while the course satisfaction is the emotional dimension of a course outcome. Therefore, these two variables can also be considered as two independent observed variables in the SEM model. Furthermore, the previous research provided conflicting results in the relationship among students' characteristics, self-regulated learning, technology self-efficacy, and course outcomes. Therefore, gender, the number of previous online courses taken, and the educational level can also be considered as three different observed variables in the model instead of the indicators of an antecedent latent variable in order to obtain a better understanding in their relationships with other variables. Hence, the Hypothesized Model is modified into Re-specified Model 2, and its results are shown on Figure 13 and Table 23.

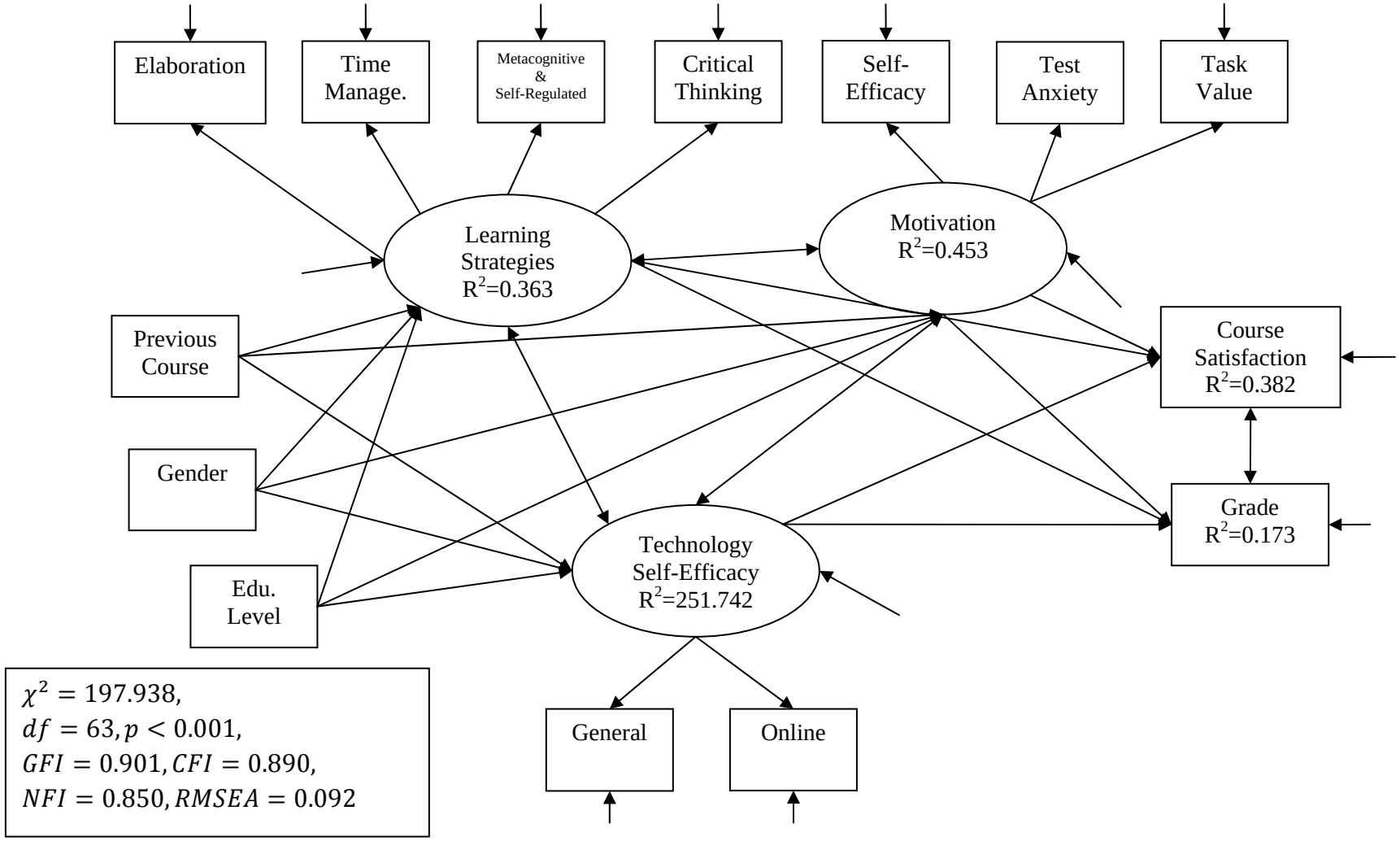


Figure 13 Results for Re-specified Model 2

The results of Re-specified Model 2 indicated an unacceptable fit between the hypothesis model and the observed data. The Chi-square test was statistically significant ($\chi^2 = 197.928, df = 63, p < 0.001$), and the CFI, and the NFI values were 0.890, and 0.850, respectively, indicating a relatively poor fit. However, the GFI and the RMSEA yielded values of 0.901 and 0.092, indicating a moderate model fit. Overall, the model was not acceptable. Not all the path coefficient demonstrated statistical significance ($p < 0.05$) and practical significance ($\beta > 0.3$). In order to assess the accuracy of the prediction in the structural equations, the proportion of variance accounted for ($R^2$) was examined. In this model, a strong effect size was reported for the endogenous variable of Motivation ($R^2 = 0.453$), whereas a strong effect size was reported for Learning Strategies ($R^2 = 0.363$). The manifest variable Course Satisfaction and Grade both demonstrated a strong amount of variances accounted for with $R^2 = 0.382$ and 0.173, respectively.

Table 23

The Estimation for Regression Weights of Re-specified Model 2

| | | | Estimate | S.E. | C.R. | P | Standardized Coefficient |
|---|---|---|---|---|---|---|---|
| MOTI | <--- | Gender | .081 | .996 | .081 | .935 | .006 |
| MOTI | <--- | Edu Level | -1.175 | 2.043 | -.575 | .565 | -.084 |
| MOTI | <--- | Course | -.001 | .224 | -.004 | .997 | -.001 |
| LS | <--- | Gender | .586 | .915 | .640 | .522 | .038 |
| LS | <--- | Edu Level | .382 | .948 | .404 | .687 | .024 |
| LS | <--- | Course | -.128 | .094 | -1.369 | .171 | -.082 |
| TECH_SE | <--- | Gender | 5.365 | 115.771 | .046 | .963 | .618 |
| TECH_SE | <--- | Edu Level | 16.534 | 325.738 | .051 | .960 | 1.844 |
| TECH_SE | <--- | Course | 1.959 | 41.477 | .047 | .962 | 2.231 |

| | | | Estimate | S.E. | C.R. | P | Standardized Coefficient |
|---|---|---|---|---|---|---|---|
| CSQ | <--- | MOTI | 1.732 | .419 | 4.136 | *** | .475 |
| Grade | <--- | MOTI | -.007 | .013 | -.514 | .608 | -.068 |
| CSQ | <--- | LS | .357 | .359 | .993 | .321 | .110 |
| Grade | <--- | LS | .011 | .011 | 1.066 | .287 | .129 |
| CSQ | <--- | TECH_SE | .404 | .366 | 1.104 | .270 | .071 |
| Grade | <--- | TECH_SE | .027 | .011 | 2.379 | .017 | .175 |
| SE | <--- | MOTI | 1.000 | | | | .790 |
| TA | <--- | MOTI | .087 | .074 | 1.175 | .240 | .077 |
| TV | <--- | MOTI | .986 | .065 | 15.074 | *** | .934 |
| EL | <--- | LS | 1.000 | | | | .937 |
| TM | <--- | LS | .481 | .062 | 7.733 | *** | .467 |
| Metacog. | <--- | LS | .832 | .062 | 13.430 | *** | .714 |
| Critical | <--- | LS | .541 | .043 | 12.504 | *** | .680 |
| Online | <--- | TECH_SE | 1.000 | | | | .829 |
| General | <--- | TECH_SE | .945 | .120 | 7.885 | *** | .831 |
| TECH_SE | <--- | MOTI | -.817 | 38.305 | -.021 | .983 | -1.282 |
| MOTI | <--- | TECH_SE | 1.000 | | | | .638 |
| TECH_SE | <--- | LS | -8.300 | 165.513 | -.050 | .960 | -14.683 |
| LS | <--- | TECH_SE | 1.000 | | | | .565 |
| LS | <--- | MOTI | 1.000 | | | | .886 |
| MOTI | <--- | LS | .497 | 1.013 | .491 | .624 | .561 |
| Grade | <--- | CSQ | .007 | .002 | 3.571 | *** | .264 |
| CSQ | <--- | Grade | 1.000 | | | | .027 |

*Final Model*

After deleting non-significant path coefficient one by one according to its *p*-value and the suggestions of modification indices, Figure 14 and Table 24 summarized the results of the Final Model. The results indicated an acceptable fit between the hypothesis model and the observed data. The Chi-square test was statistically significant ($\chi^2 = 88.354, df = 41, p < 0.001$), indicating a relatively poor fit. However, the GFI, the CFI, the NFI and the RMSEA values are 0.947, 0.958, 0.926 and 0.067, respectively, indicating a good model fit. Overall, the model was acceptable. All the path coefficients demonstrated statistical significance ($p < 0.05$) and some paths also demonstrated

practical significance ($\beta > 0.3$). The endogenous variable of Learning Strategies demonstrated a small to moderate amount of variance accounted for with $R^2 = 0.028$, whereas Motivation demonstrates a strong amount of variances accounted for with $R^2 = 0.690$. The endogenous variable of Technology Self-Efficacy demonstrated a strong amount of variances accounted for with $R^2 = 0.206$. The manifest variable Course Satisfaction demonstrated strong amounts of variances accounted for with $R^2 = 0.386$, while Grade demonstrates small to moderate amounts of variances accounted for with $R^2 = 0.167$.

Table 24

The Estimation for Regression Weights of Final Model

| | | | Estimate | S.E. | C.R. | P | Standardized Coefficient |
|---|---|---|---|---|---|---|---|
| LS | <--- | Course | .258 | .100 | 2.570 | .010 | .167 |
| MOTI | <--- | LS | .743 | .061 | 12.265 | *** | .831 |
| CSQ | <--- | MOTI | 2.253 | .221 | 10.172 | *** | .621 |
| TECH_SE | <--- | MOTI | .286 | .049 | 5.847 | *** | .454 |
| Self-Efficacy | <--- | MOTI | 1.000 | | | | .796 |
| Task Value | <--- | MOTI | .963 | .062 | 15.502 | *** | .916 |
| Elaboration | <--- | LS | 1.000 | | | | .930 |
| Time Manage. | <--- | LS | .485 | .063 | 7.735 | *** | .468 |
| Metocog. | <--- | LS | .844 | .062 | 13.518 | *** | .720 |
| Critical Think | <--- | LS | .550 | .044 | 12.618 | *** | .687 |
| Online | <--- | TECH_SE | 1.000 | | | | .817 |
| General | <--- | TECH_SE | .979 | .125 | 7.843 | *** | .851 |
| Grade | <--- | CSQ | .009 | .002 | 5.217 | *** | .315 |
| Grade | <--- | TECH_SE | .029 | .011 | 2.778 | .005 | .187 |

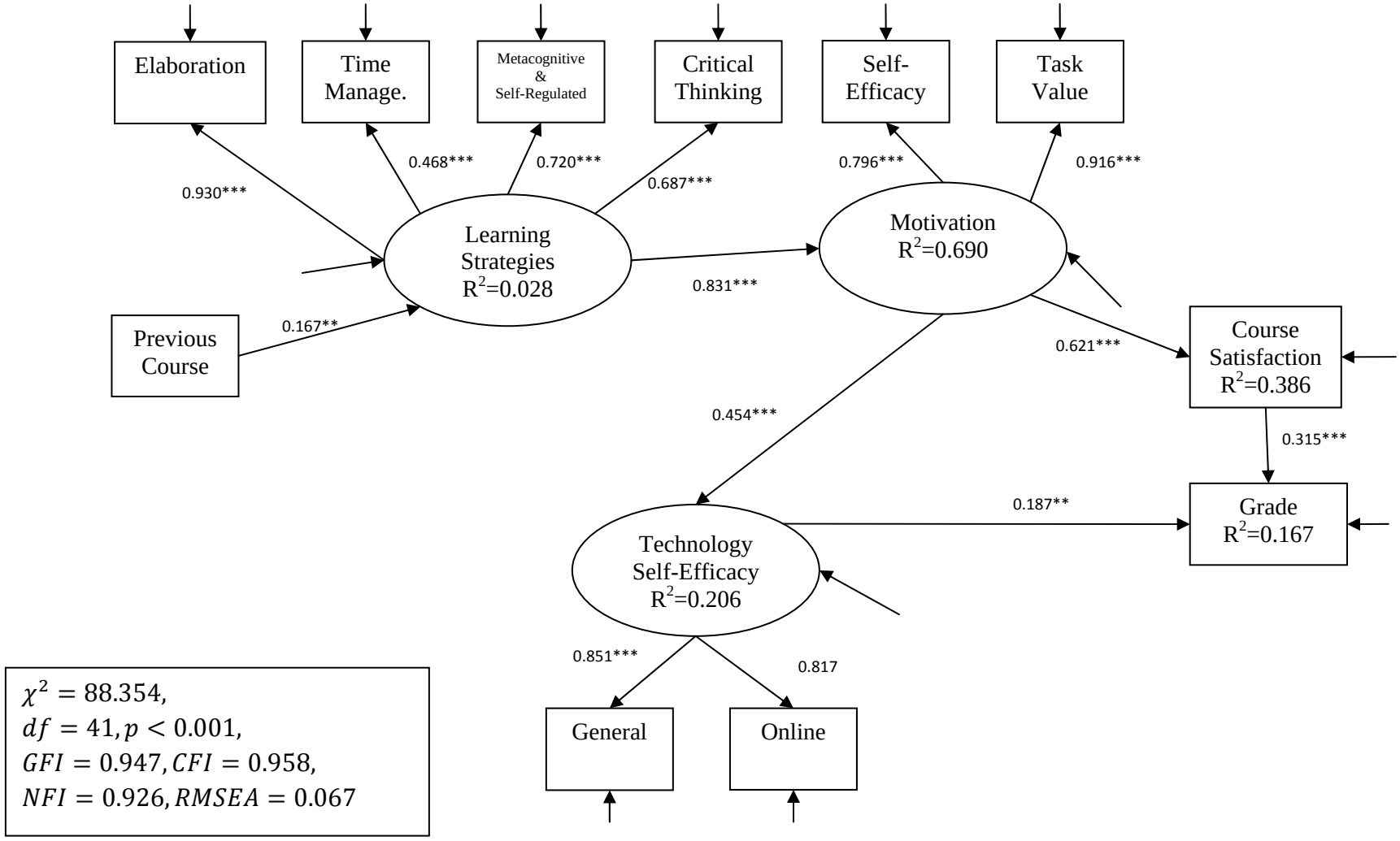


Figure 14 Results for Final Model

Based on the Final Model, the number of previous online courses taken affected the learning strategies of online learning. Students with more experiences in taking online courses resulted using more effective learning strategies toward their online courses. For every standard deviation of the number of online courses have taken increased, the learning strategies effectiveness increased by a 0.167 standard deviation. In addition, the effectiveness of learning strategies influenced the levels of motivation. Students who reported more effective learning strategies also reported higher levels of motivation toward their online courses. For every standard deviation of the learning strategies effectiveness increased, the levels of motivation increased by a 0.831 standard deviation.

In addition, the levels of motivation influenced students' levels of course satisfaction as well as their technology self-efficacy. Students with a higher level of motivation indicated higher level of satisfaction toward their online courses. Also, they had a higher level of technology self-efficacy when taking online courses. For every standard deviation of the levels of Motivation increased, the levels of Course Satisfaction increased by a 0.621 standard deviation, and the levels of Technology Self-Efficacy increased by a 0.454 standard deviation.

Furthermore, the levels of course satisfaction and the levels of technology self-efficacy affect the final grade. Students with higher levels of course satisfaction and higher levels of technology self-efficacy toward their online courses tended to achieve a higher final grade. For every standard deviation of the levels of Course Satisfaction increased, the Grade increased by a 0.315 standard deviation, while for every standard deviation of the levels of Technology Self-Efficacy increased, the Grade increased by a 0.187 standard deviation.

Finally, Learning Strategies was the mediator between the number of Previous Online Courses taken and the Motivation, whereas the Motivation was the mediator between the Learning Strategies and the Course Satisfaction, and between the Learning Strategies and the Technology Self-Efficacy. The Technology Self-Efficacy and the Course Satisfaction were the mediators between the Motivation and the final Grade.

***Research Question 1: Overall, can the hypothesized model explain the relationship among students' characteristics and previous online learning experiences, self-regulated learning (motivation and learning strategies), technology self-efficacy, and course outcomes (achievement and course satisfaction) in online learning settings?***

The exogenous variable in this research was students' characteristics with three indicators, the number of previous online courses taken, the gender of the participants and the educational level of the participants (undergraduate or graduate students). The endogenous variables in this research were motivation, learning strategies, and course outcomes. The indicators for the latent variable of motivation were the perception of the test value, and the level of academic self-efficacy, whereas the indicators for learning strategies were the effectiveness of elaboration, the effectiveness of time management, effectiveness of self-regulated learning and metacognition strategies, and the effectiveness of critical thinking. The indicators for the technology self-efficacy were the self-efficacy in completing general computer tasks, and the self-efficacy in completing online courses related computer tasks. The indicators for course outcomes were the level of course satisfaction and the final grade of the most recent online courses.

Based on the results of the Structural Equation Model, the initially hypothesized model did not yield a good fit. After model re-specifications, the final model provided an appropriate fit for the observed data. The results indicated that students with more previous online course experience usually used more effectiveness of learning strategies in their online courses. With the use of more effective learning strategies, students have higher levels of motivation and then led to higher levels of course satisfaction and higher levels of technology self-efficacy. Students with higher levels of course satisfaction and technology self-efficacy got better grades in online courses.

***Research Question 2: Do students' characteristics and previous online learning experiences influence self-regulated learning, technology self-efficacy, and course outcomes (achievement, and satisfaction) in online learning settings?***

The students' characteristics and previous online learning experiences consisted of three indicators, the number of previous online courses taken, the gender of the participants, and the educational level of the participants (undergraduate or graduate students). Only the number of previous online courses taken was retained in the final model. The previous online learning experience directly influenced the effectiveness of learning strategies used in online learning settings (critical ratio=2.570, $p$=0.010). The more previous online courses the students had taken, the more effective learning strategies they used in online learning. To be more specific, for every unit of previous online course taken, the effectiveness of learning strategies used will increase by 0.167 unit.

***Research Question 3A: Does students' self-regulated learning influence the course outcomes in online learning settings?***

The measure for students' self-regulated learning was the Modified MSLQ, which was modified from the original MSLQ in order to measure the self-regulated learning in online learning settings. Based on Pintrich et al. (1993), the original MSLQ consisted of two different constructs, motivation and learning strategies. Artino, & McCoach (2008) found that the modified MSLQ has the same constructs as the original MSLQ. This study also found separate motivation and learning strategies constructs based on factor analysis. Therefore, self-regulated learning in this study consisted of both motivation and learning strategies latent variables. The course outcomes in this study consisted of the levels of course satisfaction and the final grade of the most recent online course.

Based on the final model, the effectiveness of learning strategies directly influenced the levels of motivation (critical ratio=12.265, $p<0.001$). The level of motivation directly influenced the level of course satisfaction (critical ratio=10.172, $p<0.001$), and the levels of technology self-efficacy (critical ratio=5.847, $p<0.001$). In addition, the level of technology self-efficacy directly influence the final grade of the most recent online course (critical ratio=2.778, $p=0.005$). Furthermore, the level of course satisfaction directly influenced the final grade of the most recent online course (critical ratio=5.217, $p<0.001$). In other words, when students used more effective learning strategies in their online learning setting, they tend to have higher levels of motivation. Finally, with the higher levels of motivation, students tended to have higher levels of course satisfaction and higher levels of technology self-efficacy.

***Research Question 3B: Does students' technology self-efficacy influence the course outcomes in online learning settings?***

Based on the results in this study, technology self-efficacy directly influenced the final grade of the most recent online course (critical ratio=2.778, p=0.005). In other words, the higher levels of technology self-efficacy led to a better final grade.

***Research Question 3C: Do students' self-regulated learning and technology self-efficacy interact with each other?***

Based on this study, students' self-regulated learning and technology self-efficacy did not interact with each other. Instead, the effectiveness of learning strategies influenced the levels of motivation directly, whereas the level of motivation influenced the levels of technology self-efficacy directly. Motivation was the mediator between the learning strategies and the technology self-efficacy.

***Research Question 4: Are self-regulated learning and technology self-efficacy mediators between students' characteristics, and the course outcomes?***

Based on the results of this study, the numbers of previous online courses taken directly influenced the effectiveness of the learning strategies used in online courses. The effectiveness of the learning strategies used in online courses directly affected the levels of motivation, whereas the level of motivation influenced the levels of course satisfaction and the levels of technology self-efficacy. In addition, the levels of course satisfaction and the levels of technology self-efficacy directly influenced the final grade. Therefore, the effectiveness of learning strategies was the mediator between the numbers of previous

online courses taken and the motivation. In addition, the mediator between the effectiveness of the learning strategies and the levels of course satisfaction, and between the effectiveness of the learning strategies and the levels of technology self-efficacy was the levels of motivation. Furthermore, the levels of the course satisfaction was a mediator between motivation and the final grade of the most recent online course. Therefore, students' self-regulated learning and their technology self-efficacy were the mediators between the previous online learning experience and the course outcomes.

## Qualitative Research Results

The qualitative data was collected based on the Modified Self-Regulated Learning Interview Schedule. It was modified from Self-Regulated Learning Interview Schedule (SRLIS, Zimmerman & Martinez-Pons, 1986). Based on their research, they categorize self-regulated learning strategies into 15 categories, self-evaluation, organizing and transforming, goal-setting and planning, seeking information, keeping records and monitoring, environmental structuring, self-consequences, rehearsing and memorizing, seeking social assistance from peers, teachers, and adults, reviewing tests, notes, or text books, and other. There were three open-ended questions in this research regarding the strategies used in keeping up with assignments (Question 1), remembering information from the class (Question 2), and reviewing the learning materials (Question 3). In order to categorize the information from participants' responses of Question 1, Question 2, and Question 3, the researcher modified Zimmerman and Martinez-Pons' (1986) categories and their definitions so the responses from the participants can be organized based on the

online learning settings. Also, students' who took online courses usually used learning strategies related to computer technology and online learning platform system. Therefore, strategies, such as checking e-mails, download files, reviewing Blackboard, reviewing lecture/video, using electronic planners…etc., were added into the categories. In addition, three strategies from Zimmerman and Martinez-Pons's categories were not used by the participants in this study. Therefore, these three categories, self-evaluation, self-consequences, and seeking professional assistance, were deleted. The final learning strategies categories included 28 categories (Table 25). The data was analyzed by Atlas.ti 5.0, which was designed to analyze qualitative data, and the frequency for these three questions is shown in Table 26.

Further, the last open-ended question was designed to collect the information about online tools students used (Question 4). The data was also analyzed by Atlas.ti 5.0. The final online tools categories included 18 categories and the frequency is shown in Table 27.

Table 25

Self-Regulated Learning Strategies Categories

| Categories of Strategies | Definitions and Example Quote |
|---|---|
| Organizing and transforming | Statements indicating student-initiated overt or covert rearrangement of instructional materials to improve learning, e.g., "*I make my own set of notes of the important items.*" |
| Goal-setting and planning | Statements indicating student setting of educational goals or subgoals and planning for sequencing, timing, and completing activities related to those goals, e.g., "*I set internal goals for myself based on the syllabus."* |
| Keeping records and monitoring | Statements indicating student-initiated efforts to record events or results, e.g., "*I kept a list of the words I got wrong*." |
| Environmental structuring | Statements indicating student-initiated efforts to select or arrange the physical setting to make learning easier, e.g., "*Make sure I'm in a quiet room where I can concentrate."* |
| Rehearsing, memorizing, and other cognitive or metacognitive strategies | Statements indicating student-initiated efforts to memorize material by overt or covert practice, e.g., "*Mnemonics, repetition, visual references."* |
| Seeking information | Statements indicating student-initiated efforts to secure future task information from nonsocial sources when undertaking an assignment, e.g., *"I googled the website to see the different perspectives from the learning materials."* |
| Seeking peer assistance | Statements indicating student-initiated efforts to solicit help from peers, e.g., *"I checking with classmates."* |
| Seeking instructor assistance | Statements indicating student-initiated efforts to solicit help from instructors, e.g., "*When I have a problem, I e-* |

| Categories of Strategies | Definitions and Example Quote |
|---|---|
| | *mail the instructor."* |
| Checking e-mail | Statements indicating student-initiated efforts to check the e-mails, e.g., *"Check email every couple of days."* |
| Checking assignments and announcements…etc. | Statements indicating student-initiated efforts to check the assignments and announcements on the Blackboard, e.g., *"Checking assignments and announcements frequently."* |
| Download files from the Blackboard | Statements indicating student-initiated efforts to download the files from the Blackboard, e.g., "*Download videos, if traveling I download the webcast to my IPOD to watch on the plane."* |
| Making hard copies | Statements indicating student-initiated efforts to make hard copies of the documents posted on the Blackboard, e.g., "*If powerpoint slides are provided by the professor, I print them and make my own notes regarding the lecture."* |
| Reviewing—not specified | Statements indicating student-initiated efforts to review information, but did not specify what kind of information, e.g., *"I review it multiple times."* |
| Reviewing records--assignments | Statements indicating student-initiated efforts to review the assignments, e.g., "*I do homework over a second or third time before the exam."* |
| Reviewing records—Blackboard | Statements indicating student-initiated efforts to logon and check the information posted on the Blackboard, e.g., *"I look at Blackboard every day."* |
| Reviewing record—Syllabus | Statements indicating student-initiated efforts to re-read the syllabus, e.g., *"I check syllabus."* |
| Reviewing record—materials online | Statements indicating student-initiated efforts to re-read the handouts or materials posted on the Blackboard, e.g., *"I use the handout provided by professor."* |

| Categories of Strategies | Definitions and Example Quote |
|---|---|
| Reviewing lecture/video | Statements indicating student-initiated efforts to re-watch the video lecture posted on the Blackboard, e.g., *"I watch and re-watch a particular part of a video-taped class if it does not make sense."* |
| Reviewing records—test | Statements indicating student-initiated efforts to re-read tests, e.g., "*I would go over all the quizzes and made sure I knew every question."* |
| Reviewing records—notes | Statements indicating student-initiated efforts to re-read notes, e.g., *"I review my notebooks mostly."* |
| Reviewing records—textbooks | Statements indicating student-initiated efforts to re-read textbooks, e.g., *"I go through the book chapters."* |
| Time management—before due | Statements indicating student-initiated efforts to manage their time by doing their assignments or tasks before it is due, e.g., "*I tried to have them complete before they were due."* |
| Time management—start early | Statements indicating student-initiated efforts to manage their time by staring their assignments or tasks as soon as possible, e.g., "*I start as soon as assignment is posted."* |
| Time management—general | Statements indicating student-initiated efforts to manage their time in general, e.g., "*I set my own schedule to watch lectures and adhere to it just as I would if I were attending in person."* |
| Using planner/calendar/reminders—Not specified | Statements indicating student-initiated efforts to use a planner/calendar/reminders to manage their learning in general way, e.g., *"I keep an agenda."* |
| Using planner/calendar/reminders—Technology | Statements indicating student-initiated efforts to use a planner/calendar/reminders to manage their learning by using technology device, e.g., *"I use Google Calendar*." |
| Using | Statements indicating student-initiated efforts to use a |

| Categories of Strategies | Definitions and Example Quote |
|---|---|
| planner/calendar/reminders—Traditional planner | planner/calendar/reminders to manage their learning by using traditional paper planners or binders, e.g., *"I create a paper (non-computer) calendar at the beginning of the semester and go through the syllabus to mark any assignment due dates."* |
| Others | Statements which cannot be categorized in above categories. |

Table 26

Frequency Table of Self-Regulated Learning Strategies Categories for Open-ended Question 1, Question 2, and Question 3

| Categories of Strategies | Keep up with Assignments # (%) | Remembering Information # (%) | Reviewing Materials # (%) |
|---|---|---|---|
| Organizing and transforming | 1 (0.39%) | **169 (66.02%)** | 19 (7.42%) |
| Goal-setting and planning | 20 (7.81%) | 0 (0%) | 0 (0%) |
| Keeping records and monitoring | 1 (0.39%) | 2 (0.78%) | 0 (0%) |
| Environmental structuring | 2 (0.78%) | 0 (0%) | 2 (0.78%) |
| Rehearsing, memorizing, and other cognitive or metacognitive strategies | 0 (0%) | 15 (5.86%) | 5 (2.00%) |
| Seeking information | 0 (0%) | 0 (0%) | 2 (0.78%) |
| Seeking peer assistance | 3 (1.17%) | 1 (0.39%) | 0 (0%) |
| Seeking instructor assistance | 4 (1.56%) | 0 (0%) | 1 (0.39%) |
| Checking e-mail | 19 (7.42%) | 0 (0%) | 5 (2.00%) |
| Checking assignments and announcement… | 0 (0%) | 0 (0%) | 4 (1.56%) |
| Download files | 0 (0%) | 0 (0%) | **26 (10.16%)** |
| Making hard copies | 0 (0%) | 0 (0%) | **71 (27.73%)** |
| Reviewing—not specified | 0 (0%) | 5 (2.00%) | 18 (7.03%) |
| Reviewing assignments | 0 (0%) | 5 (2.00%) | 2 (0.78%) |
| Reviewing BlackBoard | **34 (13.28%)** | 1 (0.39%) | **27 (10.55%)** |
| Reviewing syllabus | **30 (11.72%)** | 1 (0.39%) | 1 (0.39%) |
| Reviewing handouts | 4 (1.56%) | 12 (4.69%) | 5 (0.02%) |
| Reviewing lecture/video | 4 (1.56%) | **40 (15.63%)** | 11 (4.30%) |
| Reviewing tests | 0 (0%) | 3 (1.17%) | 2 (0.78%) |
| Reviewing notes | 1 (0.39%) | **26 (10.16%)** | 4 (1.56%) |
| Reviewing textbooks | 0 (0%0) | 9 (3.52%) | 1 (0.39%) |
| Time management—before due | 4 (1.56%) | 0 (0%) | 0 (0%) |

| Categories of Strategies | Keep up with Assignments # (%) | Remembering Information # (%) | Reviewing Materials # (%) |
|---|---|---|---|
| Time management—start early | 14 (5.47%) | 0 (0%) | 0 (0%) |
| Time management—general | **45 (17.58%)** | 2 (0.78%) | 6 (2.34%) |
| Using planner/calendar/reminders Not specified | **73 (28.52%)** | 4 (1.56%) | 3 (1.17%) |
| Using planner/calendar/reminders Technology | **34 (13.28%)** | 1 (0.39%) | 0 (0%) |
| Using planner/calendar/reminders Traditional planner | 15 (5.86%) | 0 (0%) | 0 (0%) |
| Others | 20 (7.81%) | 13 (5.08%) | 25 (9.77%) |

***Question 1: What strategies do you use to keep up to date with assignments in this class?***

Most students reported that they used a planner or calendar to keep up with the assignments, while some students said that they reviewed Blackboard and the syllabus.

Generally, students reported more than one strategy used to keep up to date with assignments in the class. For example, students said:

*"I create a paper (non-computer) calendar at the beginning of the semester and go through the syllabus to mark any assignment due dates. I usually check my e-mail multiple times a week (not necessarily every day) and I pay attention to due dates."*

*"In order to keep track of due dates for assignments I refer to the syllabus and Blackboard calendar frequently and write due dates in my personal planner. At the*

*beginning of each week I make a "study plan" for myself that outlines what I will do each day."*

Based on the data analysis results, most students used planners/calendars to keep up with assignments in the class. Most of them did not specify what kind of planners they were using (28.52%). However, some students indicated that they used a technology device (13.28%), such as cellphone, Blackboard calendar, Outlook calendar, whereas some students stated they used traditional paper planners or binders (5.86%) from which they can track the due dates or their progress anytime. For example:

"*A planner which I use multiple times each day. Also, constant "To-do" lists."*

"*I have a very organized planner, and I put reminders in my phone."*

"*Post assignment due dates on my email calendar."*

In addition, students reported that they used time management skills in keeping up with the assignments in the class. Most of them reported they used general time management skills or did not specify their strategies (17.58%), whereas some students stated that they either started their work early (5.47%) or before the due date (1.56%). Some students reported that they set goals by the beginning of the semester or at the beginning of the week to make sure they can keep up in the class (7.81%). For example, students reported that:

*"Dedicating consistent time and sufficient workspace at home to stay on top of things."*

*"Start as soon as assignment is posted, even if it's just to download some sample code or write a single function. 2.) as much as possible work on it a little EVERY day, even if it's just writing a single line of code."*

*"I set internal goals for myself based on the syllabus."*

Finally, students logon to the Blackboard regularly (13.28%), reviewed the syllabus (11.72%), and checked the e-mails (7.42%) to update themselves and track their progress. Also, few students indicated that they would e-mail their classmates or instructors to make sure they did not miss anything (peer: 1.17%; instructor: 1.56%). For example:

*"I look at Blackboard every day, including mail, assignments, and discussion boards."*

*"Emailing professor, reviewing syllabus, checking with classmates."*

*"I highlight the due dates in the syllabus and then I put them in my personal planner. I review my syllabus and planner frequently."*

***Question 2: What strategies do you use when trying to remember information from class/videos?***

Unlike the first question, students' responses in this question demonstrated similar strategies. Generally, students used more than one strategy in trying to remember

information from class/videos. Sixty-four percent of students reported that they used the organizing and transforming strategy, especially note taking, to help them remember the class materials. For example, some students reported that:

> "T*ake notes, much like in class. I note the specific time mark on a video if there is material that is particularly important (studying for test) or confusing (watch it more than once)."*
>
> *"I treat the online class like a typical class. I take notes and when needed pause the class to better understand the concepts. I feel that I have made better notes trough my distance ed courses when compared to my in class experience."*
>
> *"I make my own set of notes of the important items. I cross reference this with review material and focus on the information / concepts that do not easily come to mind."*

Students also reported that they reviewed the video (15.63%) or the notes (10.16%) or the handouts/PowerPoint slides (4.69%) in order to remember the learning materials. Students also applied rehearsing, memorizing strategies (5.86%) in learning the materials. Interestingly, some students reported they tried to treat the online courses no different than the traditional classes in campus.

> *"The thing that helps the most is to work practice problems - and practice exams that I make up. I do homework over a second or third time before the exam. I*

*watch and re-watch a particular part of a video-taped class if it does not make sense."*

*"Take notes. Re-read notes. Occasionally I'll re-watch a section of video to review something I'm not sure of (it's a very nice option to have)."*

*"take notes, flash cards, review, read aloud, mnemonics, repetition, visual references."*

***Question 3: What strategies do you use when reviewing the materials available through the distance education site (WebCT, Blackboard, etc…)***

Students usually used more than one strategy in reviewing the materials. The most frequently reported strategy was making hard copies of the learning materials (27.73%) so they can highlight, and read the materials whenever needed. They also reviewed and checked the Blackboard (10.55%), downloaded learning materials and saved them in the computer (10.16%), and took notes (6.64%). For example:

*"I print any online handouts, study guides, lecture notes from the teacher, etc., read them, make notes, and keep them handy when I am reading out of the text of working on assignments."*

*"I check blackboard periodically to make sure I have the most current documents for the courses."*

*"Download videos, if traveling I download the webcast to my IPOD to watch on the plane."*

To sum up, students used planners and reviewed Blackboard and syllabus in order to keep up with the assignments. In addition, they usually used organizing and transforming strategies, especially note taking, in order to remember the learning materials. Furthermore, they made hard copies of learning materials and reviewed the Blackboard to review these learning materials.

Among 30 strategy categories, "Reviewing Blackboard" was the most used strategy in keeping up with assignments and in reviewing learning materials. Some other strategies were used based on the tasks. For example, using a planner was only applied when students kept up with assignments, while organizing and transforming strategies was only used when they remembered the learning materials. Further, making hard copies was only used when students reviewed the learning materials. Finally, some strategies were rarely used, such as keeping records and monitoring, environmental structuring, seeking information, seeking peer assistance, seeking instructor assistance, checking assignments and announcement, and time management—before the due date.

***Question 4: What online tools (e.g. e-mails, discussion board, gradebook, etc…) do you use most often and how are these helpful?***

Students used more than one online tool when taking online courses. Most students reported they used the functions provided in the online learning platform, Blackboard, in general (16.80%). Some students found that e-mails were the most efficient way to communicate in general (16.02%), and some specified that they used discussion board to communicate with other students (10.55%).

In addition to the tools provided by the Blackboard, students found the internet search engine (21.09%) and online library (9.77%) were very useful in terms of writing papers and clarifying information. They also used online calendars to help them keep up in the class (4.30%). When they needed to complete a collaborative project, they used shared documents, such as google doc, to work together (2.34%). Some students pointed they used internet a lot, but did not provide more specific information (3.52%).

Table 27

Frequency Table of Online Learning Tools Categories for Open-ended Question 4

| Categories of Tools | # (%) | Example Quote |
|---|---|---|
| Search engine | 54 (21.09%) | *"google, you can find the answer to any objective problem."* |
| Blackboard—general | 43 (16.80%) | *"Blackboard, primarily the areas where the teacher communicates with the students."* |
| E-mails | 41 (16.02%) | *"email, I was able to talk to my teacher when i needed to talk with her."* |
| Discussion board | 27 (10.55%) | *"Discussion board. Very helpful for both the working out of ideas with other classmates and for getting help for ideas I didn't initially understand very well."* |

| Categories of Tools | # (%) | Example Quote |
|---|---|---|
| Online library | 25 (9.77%) | *"Online library and access to research journals--this has been immensely helpful and I would not have been able to write papers without it."* |
| No tools were used | 15 (5.86%) | *"no online tools were used." "I don't use any blackboard online tools."* |
| Others | 13 (5.08%) | *"Varied and depends on the class...I did not use anything in the distance class that I have not used in a brick and mortar class."* |
| Online calendar | 11 (4.30%) | *"calendars — to keep track of assignments."* |
| Stream video | 9 (3.52%) | *"The videos - when I don't understand...I rewind, rewind, rewind until I do. This is very helpful."* |
| Internet—general | 9 (3.52%) | *"I use the internet a lot."* |
| Shared documents | 6 (2.34%) | *"Google documents and Skype help to collaborate in groups and make efficient use of time."* |
| Gradebook | 5 (1.95%) | *"…just went on Blackboard to view grades."* |
| Quiz | 4 (1.56%) | *"The quizzes because the questions helped me remember and understand the material."* |
| Computer program | 4 (1.56%) | *"none online - i use excel and word"* |
| Online chat or skype | 4 (1.56%) | *"The single most important thing is finding a fellow distance ed student and studying together with this person. That's how a friend and I got through our online masters program. A simple online chat is often the best tool…"* |
| Instructors' webpage | 3 (1.17%) | *"My professor has her own webpage with several links that are useful for her classes and our study. So, I use her website."* |

| Categories of Tools | # (%) | Example Quote |
|---|---|---|
| Textbook website | 3 (1.17%) | *"I take advantage of any review materials and or practice tests provided by the textbook publisher. I find this very helpful in test preparation. "* |
| Download or upload files | 2 (0.78%) | *"Downloading notes from the class, and printing them off. They help me to have a tangible record of what I am learning."* |

## Summary

This research focused on determining the relationship among students' characteristics, self-regulated learning, technology self-efficacy, and course outcomes in online learning settings. The descriptive statistics (mean and standard deviation) of each variable were reported. Bivariate correlations between variables suggested that there was a small possibility of multicollinearity. In addition, the correlation coefficient between observed variable and its latent variable indicated that there was a linear relationship between them. Further, the correlation coefficients among latent variables indicated that there were linear relationships among them. All these information suggested that it was appropriate to conduct a structural equation modeling data analysis.

The SEM results yielded a Final Model, which indicated that, the number of previous online courses taken directly influenced the effectiveness of students' learning strategies, and then directly affected students' levels of motivation. Students' levels of motivation directly influenced students' levels of course satisfaction and their levels of technology self-efficacy, whereas the levels of course satisfaction and the levels of

technology self-efficacy directly affected students' final grade. In addition, the effectiveness of learning strategies was the mediator between the number of previous online course taken and students' level of motivation. Students' levels of motivation was the mediator between their effectiveness of learning strategies and course satisfaction, and between their effectiveness of learning strategies and technology self-efficacy. Finally, students' levels of course satisfaction and their levels of technology self-efficacy were mediators between their levels of motivation and their final grade.

The results from open-ended questions indicated that students used more than one learning strategy in terms of keeping up with assignments, remembering learning materials, and reviewing the learning materials. They also used more than one online tool when taking the online courses. Most of the participants reported that they used planners and referred to the Blackboard and syllabus for keeping up with assignments. They took notes and reviewed the stream videos if needed when trying to remember the information provided in the class. In addition, they downloaded the files and made hard copies for reviewed the learning materials through the online courses. Further, they used Blackboard functions and internet search engines most when they took online courses.

# V. CONCLUSIONS AND DISCUSSIONS

This chapter presents a summary and conclusions of this study. A discussion of conclusions, limitations of this study, and recommendations for further research is also presented.

## Summary of Study

The purpose of this study was to examine the relationship among students' characteristics, self-regulated learning, technology self-efficacy, and course outcomes in online learning settings. A hypothesized model was generated based on previous research. Two hundred and fifty-six students participated in this study. All participants completed an online survey hosted via SurveyMonkey.com. The survey consisted of a total of 130 items with a demographic questionnaire, the Modified Motivation Strategies Learning Questionnaire, the Open-ended Learning Strategies Questionnaire, the Online Technology Self-Efficacy Scale, the Course Satisfaction Questionnaire, and the final grades. Structural Equation Modeling was served as the major data analysis method.

Descriptive statistics related to the responses from the demographic questions were presented in Chapter III. According to the previous research and factor analysis results, observed variables, the gender, the educational level, the number of online courses taken, self-efficacy, test anxiety, task value, elaboration, time management, self-

regulation and metacognition, critical thinking, general technology self-efficacy, online learning platform technology self-efficacy, final grade, and course satisfaction were identified as the observed variables. The students' characteristics, self-regulated learning (motivation and learning strategies), technology self-efficacy, and course outcomes were latent variables. The descriptive statistics of the variables were presented in Chapter III. In addition, the correlation procedures were performed between observed variables and their latent variable, as well as among latent variables. The results indicated that there were linear relationships between observed variables and their latent variable. Also, there was a linear relationship among latent variables.

The results indicated that the initially hypothesized modelwas not an appropriate one in terms of explaining the relationship among students' characteristics, self-regulated learning, technology self-efficacy, and course outcomes. After model re-specification, a final model with good fit was obtained. Based on the results from the final model, the number of previous online courses taken directly influenced the effectiveness of students' learning strategies in taking online courses, and then, directly affected the students' levels of motivation. Students' levels of motivation influenced their levels of technology self-efficacy and course satisfaction. Finally, their levels of technology self-efficacy and course satisfaction affected their final grades. In other words, students with previous online learning experiences tended to have more effective learning strategies when taking online courses, and hence, had higher levels of motivation in their online courses. When students had higher levels of motivation in their online courses, their levels of technology self-efficacy increased, and their levels of course satisfaction also increased. As their levels of technology self-efficacy and course satisfaction increased, their final grade

tended to be better than those of the students who did not have experiences in taking online courses.

In order to understand the specific learning strategies students used in taking online courses, four open-ended questions which were modified from Self-Regulated Learning Interview Schedule (Zimmerman & Martinez-Pons, 1986) were used. The results indicated that students used planners/calendars, and reviewing Blackboard and syllabus in order to keep up with the assignments. Most of the students took notes in terms of remembering the learning materials and some reviewed the stream videos. In addition, in order to review the learning materials, students downloaded the files posted on the Blackboard and made hard copies to have everything handed. While taking online courses, students used search engine, Blackboard, and online library a lot in order to obtain more information. They also reported that the e-mails and discussion board were very useful in terms of interacting with the instructors and their classmates.

## Conclusions

The following conclusions are supported by data from this study.

1. The number of previous online courses taken influences the levels of self-regulated, and then affects the technology self-efficacy and course outcomes. To be more specific, the more online courses students have taken, the more effective learning strategies they use in the current online courses. With using more effective learning strategies, students have higher levels of motivation in their online courses. The higher levels of motivation then leads to higher levels of technology self-efficacy and higher levels of course satisfaction. The higher levels

of technology self-efficacy and course satisfaction result in a better grade in their web-based courses.

2. In general, self-regulated learning is the mediator between the numbers of previous online courses taken and course outcomes in web-based courses. To be more specific, learning strategies is the mediator between the numbers of previous online courses taken and motivation in web-based courses. In addition, motivation is the mediator between learning strategies and course satisfaction.
3. Self-regulated learning is also the mediator between the numbers of previous online courses taken and technology self-efficacy.
4. Technology self-efficacy is the mediator between self-regulated learning and final grade in web-based courses.
5. There is no interaction effect between self-regulated learning and technology self-efficacy.
6. Course satisfaction is the mediator between the self-regulated learning and final grade.
7. Students who take online courses tend to use planner/calendar, reviewing Blackboard and syllabus to keep up with the assignments.
8. Students who take online courses tend to take notes, reviewing lecture videos, and reviewing notes to remember the learning materials.
9. Students who take online courses download the learning materials, review the materials on the Blackboard, and make hard copies in order to review the learning materials.

10. Students use search engine, Blackboard, e-mails, discussion board, and online library as the online tools when taking online courses.

## Discussion

### *Course Outcomes*

The present research suggested that students' course satisfaction influences their final grade in web-based course. According to Bean and Bradley (1986), course satisfaction had a significant effect on the performance but the performance did not have a strong positive effect on course satisfaction. Results from this research supported their conclusion. Further, Astin (1993) suggested that satisfaction was an important intermediate outcome between students' level of motivation and their performance. Results from this research also supported his point of view that the course outcome was the mediator between students' levels of motivation and their performance. However Bean and Bradley (1986) also suggested that the relationship between course satisfaction and performance cannot be assumed as a one-way causal relationship. They believed that other factors also influence whether high level of satisfaction leads to strong performance or strong performance leads to high level of satisfaction. For example, the effects of performance on satisfaction may be different from students who emphasize on intellectual to those who emphasize on social life in campus. For students with intellectual emphasis, the higher grades usually leads to higher level of course satisfaction. On the other hand, for students with social life emphasis, higher course satisfaction usually leads to higher performance. Therefore, further investigation on the relationship between course satisfaction and achievement is needed.

*Self-Regulated Learning*

1. Results Based on Quantitative Data

Previous research results suggested that self-regulated learning affected course satisfaction and performance (Artino & McCoach, 2008; Paechter et al., 2010; Puzziferro, 2008). The results of this study supported previous findings. More specifically, results in this study indicated that the effectiveness of learning strategies affects the level of motivation, whereas the levels of motivation influences students' perception of course satisfaction, and the levels of course satisfaction affects the performance. In other words, by applying more effective learning strategies, one increases their level of motivation, and increases the levels of motivation toward online courses lead to higher levels of course satisfaction and better performance. According to Zimmerman's model of self-regulation (2000), motivational beliefs should underlie each phase of the self-regulatory process. In other words, motivational beliefs, such as self-efficacy and goal orientation, influences forethought, goal setting and strategic planning stage, which means that motivation affectes learning strategies. The results of this study did not support Zimmerman's model. The possible explanation is that students with more experiences in taking online courses were familiar with the online learning settings. Therefore, they had more effective learning strategies in taking online courses, which then led to the higher levels of motivation toward their online courses.

Pintrich (2004) pointed out that self-regulatory activities are mediators between personal and contextual characteristics and actual achievement or performance. However, there was limited research focusing on this characteristic of self-regulated learning. This

research results supported his point by suggesting that self-regulated learning was the mediator between the numbers of previous online courses taken and the course outcomes.

There was an interesting result shown in this research. Although test anxiety was identified as an observed variable of self-regulated learning based on the factor analysis, and it also was statistically significant in relation to motivation, the structural equation modeling results suggested it to be removed as an indicator. Pintrich and Schunk (1996) stated that test anxiety is a combination of cognitive and emotional components that accompany anxiety, such as thinking about the consequences of failing the test, worrying about being unable to finish the test, worrying about making bad grades, and experiencing emotional arousal when taking a test. Based on Pintrich and DeGroot (1990), test anxiety was not correlated with learning strategies used for seventh graders from traditional learning settings. However, it was negatively correlated with self-regulation and performance. They suggested that the results indicated the poor performance of high anxious students resulted from the interference of the test anxiety during the exam, not because they did not have adequate cognitive skills (Pintrich & DeGroot, 1990; Howey, 1999). Yukselturk and Bulbut (2009) also found that female students with higher levels of test anxiety received lower grades in online courses. The result from present study was different from the previous research. However, Yukselturk and Bulbut (2007) also found that test anxiety was not a statistically significant predictor of students' performance in web-based courses. Therefore, follow up research is needed in terms of understanding the role of test anxiety in online learning settings and if there is a gender difference.

Self-regulated learning strategies can be promoted by the instructor or instruction (McMahon & Oliver, 2001; McLoughlin, 2002; Yang, 2006). McMahon and Oliver (2001) suggested that a well designed online environment should take both affective and cognitive processes into account in order to enhance students' self-regulated learning. They also provided suggestions regarding the integration of learner activities, learner supports and learning resources in online learning environment (Figure 14).

2. Results Based on Qualitative Data

The results from open-ended questions in this study suggested that students used planners/calendars, and reviewing Blackboard and syllabus in order to keep up with the assignments. Most of the students took notes in terms of remembering the learning materials and some reviewed the stream videos. In addition, in order to review the learning materials, students downloaded the files posted on the Blackboard and made hard copies to have everything handed. While taking online courses, students used a search engine, the Blackboard, and the online library a lot in order to obtain more information. They also reported that the e-mails and discussion board were very useful in terms of interacting with the instructors and their classmates.

Whipp and Chiarelli (2004) interviewed six adult learners in order to understand the self-regulated learning strategies they used in online learning settings. The results indicated that these online learners adapted similar self-regulated learning strategies which were also used in traditional learning settings, but they also used some strategies which were unique to the online learning settings. The results of present study supported his findings that students modified their learning strategies in order to adapt to online learning settings. For example, students reported that they logon to the Blackboard

regularly in order to keep up with assignments, they had to manage their work and study time, they had to set up a specific time to complete their online course work as if they were in the traditional learning settings, they had to print out the learning materials in order to review them anytime, and they had to interact with the instructors and classmates through discussion board, e-mails, or skype.

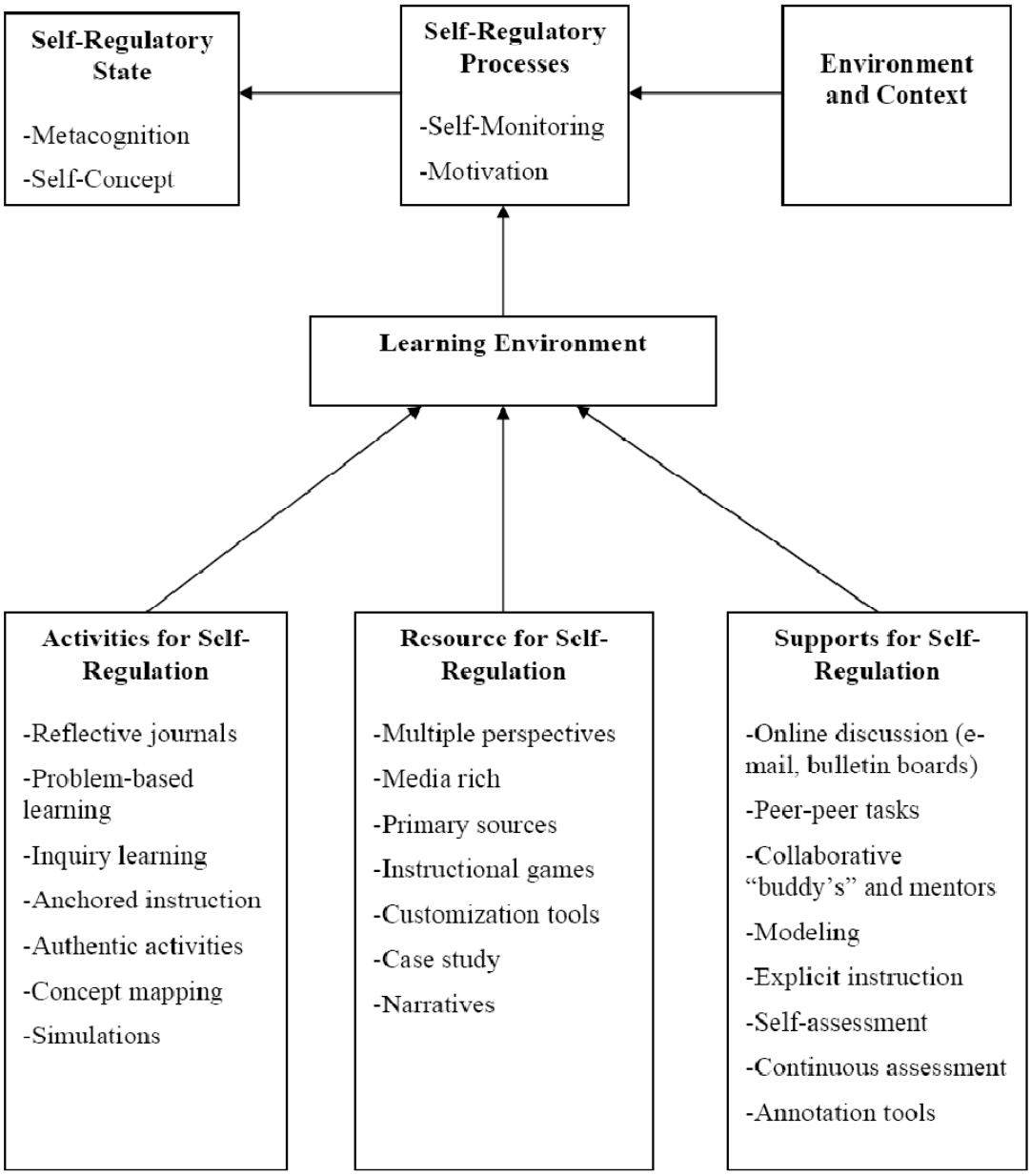


Figure 14 Self-regulatory processes enhanced through the integration of learning activities, learning supports, and learning resources in an online learning environment (Adapted from McMahon and Oliver, 2001, pp. 1303)

*Technology Self-Efficacy*

The results of this study did not support DeTure (2004) and Puzziferro's (2008) perspective that technology self-efficacy does not affect the course outcomes. In contrast, the results imply that technology self-efficacy was directly influenced by motivation and then affected the final grade. In other words, students with higher levels of technology self-efficacy tended to received better grades. Based on this study, the technology self-efficacy included two different dimensions, general computer self-efficacy and online learning platform related self-efficacy. This implied that students who want to succeed in online learning should have confidence in general computer skills as well as in using online learning platforms.

In addition, the numbers of previous online courses taken was the antecedent variable which influenced the levels of technology self-efficacy through self-regulated learning. It was also implied that students with more previous experiences in taking online courses had higher levels of technology self-efficacy. Arbaugh (2004) found that students' perception of online courses, such as delivery medium satisfaction, flexibility…etc., statistically significantly changed between their first and second online courses. He suggested that students need to take at least two online courses before they can come to a conclusion about it. He also suggested that the instructor should pay more attention to those students who first take the online courses in terms of encouraging students to participate and persist in their online courses. Furthermore, he pointed out that the perceived usefulness and perceived ease of use of a technology influenced students' attitudes toward the technology and their willingness to adopt the technology. Therefore,

these suggestions also implied that technology self-efficacy can be promoted by the instructiors. By providing an introduction to use online learning platform, such as using the discussion board, checking grades online, how to download/upload documents, as well as sending/receiving e-mails, students will be more comfortable in using the online learning platform. In addition, an introduction to conduct an internet search through a search engine, and using online library database also evoke students' ability in finding useful resources in taking online courses. Finally, the online courses should be conducted under a user-friendly platform to encourage students' persistent in online courses.

*Students' Characteristics*

The results of this research support the previous research that there was no gender difference nor educational level difference in self-regulated learning and technology self-efficacy (Bates, & Khasawneh, 2004; Busch, 1995; Imhof et al., 2007; Lim et al., 2006; Yukselturk, & Bulut, 2007). However, previous online learning experiences influence the self-regulated learning directly. To be more specific, the numbers of previous online courses taken influenced effectiveness of learning strategies directly, and affected the levels of motivation through the effectiveness of learning strategies.

Pintrich and Zusho (2002) discussed the moderating role of gender and ethnicity. They stated that girls had lower academic competence than boys, whereas Asian-American students exhibited lower self-efficacy than African-American students. Even though girls reported a lower level of self-efficacy, they tended to use more self-regulatory strategies than boys. In addition, they stated that different ethnicities may

apply different self-regulatory learning strategies. However, they also pointed out that researchers have not systematically investigate the role of gender and ethnicity in self-regulatory processes. Therefore, further studies in understanding the role of gender and ethnicity related to self-regulated learning in online learning setting are needed.

## Limitations

The first limitation of this study is that it was a non-experimental quantitative research designed with self-report survey measures. Therefore, the interpretation and generalization of the results to other populations should be donewith caution.

The response rate in this study was 12.05%, which was low. The research materials are delivered via university E-mail system. There were possibilities that the potential participants ignored or did not check their E-mails, the survey was identified as junk or bad E-mail address, which can also explain the low response rate in this research.

Finally, the grades were self-reported, which might not be the actual grades the participants received. Further, the grades were also recorded in letter grades (A, B, C, D or F), which led to small variance and influences the accuracy of estimation. Further research should use numerical grades, 100-point scale, in representing grade instead of A, B, C, D etc. categories if possible.

## Recommendations

The following recommendations are based on the findings, conclusions, and discussion of this study:

*For Researchers*

1. Since there has been limited research examining self-regulated learning as the mediator between students' characteristics and course outcomes, future research should consider investigating the mediator effect of self-regulated learning, and comparing its role in traditional and online learning settings.
2. Researchers should also continue to examine the self-regulated process. Does the motivation underlie the learning strategies or do the learning strategies underlie the motivation? Is the process in a traditional learning environment different than it is in online learning settings? Or perhaps a more complex process underlies these two variables?
3. The present study did not include ethnicity as an observed variable in students' characteristics latent variable. Previous research regarding the moderating role of ethnicity in self-regulated learning was limited in online learning settings. Therefore, further research focusing on the role of ethnicity in traditional learning environment and in online learning settings is needed.
4. The results of previous research and this research regarding the role of test anxiety are not consistent and is unclear. Therefore, further research in understanding and comparing the role of test anxiety in self-regulated learning in traditional learning environment and online learning settings is needed.
5. The specific self-regulated learning strategies students used in traditional learning environment and online learning settings should continue to be a focus of researcher in the future to understand which strategies are most effective and how they can be encouraged or promoted.

*For Institutions, Instructors, and Students*

1. The institutions have to provide a friendly and easy use online learning platform to increase students' willingness in taking online course and their levels of online learning technology self-efficacy.
2. The institutions have to provide workshops to both instructors and students to help them familiar with the online learning platform.
3. The instructors have to pay attention to the students who are taking their first online course by encouraging them to participate and persist in their online courses.
4. The instructors have to be familiar with the online learning environment and platform so they can help students to participate in the online courses. In order to do so, they can provide introductory sessions which include the information students need to take the online courses at the beginning of the class, and provide prompt feedbacks when students have problems.
5. The instructors can design the course activities in a way that can also help students improve their self-regulated learning strategies and their levels of technology self-efficacy. For example, the instructors can ask students to keep a learning journal, to participate in the discussion on the discussion board at least certain times a week, or assign the projects which are required collaborative work.
6. In order to success in the online courses, students have to take the online courses as if they were taking traditional courses. In other words, students have to set up a specific time or even a specific place so they can concentrate on the learning materials and the assignments of the online courses.

## Summary

The findings in this study provide a model in terms of understanding the relationships among students' characteristics, technology self-efficacy, self-regulated learning, and course outcomes. By using structural equation modeling, the current study also provided more reliable estimations and a holistic understanding than least square solution results. The results indicated that the number of previous online courses students had taken influenced the effectiveness of learning strategies used. When students used more effective learning strategies, their levels of motivation were also increased. As their levels of motivation increased, their levels of satisfaction toward the online course and the levels of technology self-efficacy were also increased, and they also got better final grades in their online courses.

Students usually used planners and reviewed the Blackboard to keep up with assignments. They used organization and transforming strategies, especially note taking, to remember the learning materials. In addition, they made copies and reviewed the Blackboard in order to review the learning materials. Finally, they used the Blackboard functions, internet search engines, and the online library when they took online courses.

The results of this study imply that the course designer and instructor can help students develop their self-regulated learning strategies and their self-efficacy in using technology so they can experience success in their online course, especially those who have no or negative experiences in their previous online learning courses.

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# APPENDICES

# Appendix A

## Institutional Review Board

AUBURN
UNIVERSITY

Office of Human Subjects Research
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October 21, 2009

MEMORANDUM TO: Chih-hsuan Wang
Education Foundation Leadership Technology

PROTOCOL TITLE: "Student Characteristics, Self-Regulated Learning, Self-Efficacy, and Course Outcomes in Web-Based Courses"

IRB FILE NO.: 09-265 EX 0910

APPROVAL DATE: October 4, 2009
EXPIRATION DATE: October 3, 2010

The referenced protocol was approved "Exempt" on October 4, 2009 under 45 CFR 46.101 (b) (2):

> "Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior, unless:
> (i) information obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects; and
> (ii) any disclosure of the human subjects' response outside the research could reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability, or reputation."

You should retain this letter in your files, along with a copy of the revised protocol and other pertinent information concerning your study. If you should anticipate a change in any of the procedures authorized in this protocol, you must request and receive IRB approval prior to implementation of any revision. Please reference the above IRB file number in any correspondence regarding this project.

If you will be unable to file a Final Report on your project before October 3, 2010, you must submit a request for an extension of approval to the IRB no later than September 15, 2010. If your IRB authorization expires and/or you have not received written notice that a request for an extension has been approved prior to October 3, 2010 you must suspend the project immediately and contact the Office of Human Subjects Research for assistance.

A Final Report will be required to close your IRB project file. Please note that the approved, stamped version of your information letter should be provided to participants during the consent process.

If you have any questions concerning this Board action, please contact the Office of Human Subjects Research at 844-5966.

Sincerely,

Kathy Jo Ellison, RN, DSN, CIP
Chair of the Institutional Review Board
for the Use of Human Subjects in Research

cc: Dr. Sherida Downer
Dr. David Shannon

APPROVED

AUBURN UNIVERSITY INSTITUTIONAL REVIEW BOARD for RESEARCH INVOLVING HUMAN SUBJECTS

# RESEARCH PROTOCOL REVIEW FORM

For Information or help contact THE OFFICE OF HUMAN SUBJECTS RESEARCH, 307 Samford Hall, Auburn University
Phone: 334-844-5966 e-mail: hsubjec@auburn.edu Web Address: http://www.auburn.edu/research/vpr/ohs/

*Complete this form using Adobe Acrobat Writer (versions 5.0 and greater). Hand written copies not accepted.*

1. PROPOSED START DATE of STUDY: Oct 1, 2009

PROPOSED REVIEW CATEGORY (Check one): ☐ FULL BOARD ☐ EXPEDITED ☑ EXEMPT

2. PROJECT TITLE: Student Characteristics, Self-Regulated Learning, Self-Efficacy, and Course Outcomes in Web-Based Courses

| 3. Chih-hsuan Wang | Graduate Student | EFLT | (334)844-8682 | wangchi@auburn.edu |
|---|---|---|---|---|
| PRINCIPAL INVESTIGATOR | TITLE | DEPT | PHONE | AU E-MAIL |

| Haley 4013, Auburn University AL36894 | (334)844-3072 | beatrace@gmail.com |
|---|---|---|
| MAILING ADDRESS | FAX | ALTERNATE E-MAIL |

4. SOURCE OF FUNDING SUPPORT: ☑ Not Applicable ☐ Internal ☐ External Agency: _____ ☐ Pending ☐ Received

5. LIST ANY CONTRACTORS, SUB-CONTRACTORS, OTHER ENTITIES OR IRBs ASSOCIATED WITH THIS PROJECT:

6. GENERAL RESEARCH PROJECT CHARACTERISTICS

## 6A. Mandatory CITI Training

Names of key personnel who have completed CITI:
Chih-hsuan wang
Dr. David M. Shannon

CITI group completed for this study: ☑ Social/Behavioral ☐ Biomedical

Protocol-Specific modules completed:
☐ Genetic ☐ Vet's Administration
☐ International ☐ Prisoner Research
☐ Public School Students ☐ Pregnant Women/Fetuses
Other _____

## 6B. Research Methodology

Please check all descriptors that best apply to the research methodology.

Data Source(s): ☑ New Data ☐ Existing Data

Will data be recorded so that participants can be directly or indirectly identified?
☐ Yes ☑ No

Data collection will involve the use of:
☐ Educational Tests (cognitive, diagnostic, aptitude, etc.)
☑ Surveys / Questionnaires
☑ Internet / electronic
☐ Audio /Video /P hotos
☐ Interview / Observation
☐ Physical / Physiological Measures or Specimens (see Section 6E.)
☐ Private records or files

The Auburn University Institutional Review Board has approved this document for use from 10/4/09 to 10/3/10 Protocol # 09-265 EX 0910

## 6C. Participant Information

Please check all descriptors that apply to the participant population.
☐ Males ☐ Females ☑ AU students

Vulnerable Populations
☐ Pregnant Women/Fetuses ☐ Children and/or Adolescents (under age 19 in AL)
☐ Prisoners

Persons with:
☐ Economic Disadvantages ☐ Physical Disabilities
☐ Educational Disadvantages ☐ Intellectual Disabilities

Do you plan to compensate your participants? ☑ Yes ☐ No

## 6D. Risks to Participants

Please identify all risks that participants might encounter in this research.
☐ Breach of Confidentiality* ☐ Coercion
☐ Deception ☐ Physical
☐ Psychological ☐ Social
☑ None ☐ Other _____

*Note that if the investigator is using or accessing confidential or identifiable data, breach of confidentiality is always a risk.

## 6E. Institutional Biosafety Approval

Do you need IBC Approval for this study? ☑ No ☐ Yes - BUA # _____ Expiration date _____

## FOR OHSR OFFICE USE ONLY

DATE RECEIVED IN OHSR: 10/14/09 by LKH
DATE OF IRB REVIEW: 10/4/09 by KJE
DATE OF IRB APPROVAL: 10/4/09 by KJE
PROTOCOL # 09-265 EX 0910
APPROVAL CATEGORY: 45 CFR 46.101(b)(2)
INTERVAL FOR CONTINUING REVIEW: 1 year
COMMENTS: original received 9/23/09; IRB review 10/4/09 as AFR
final revisions received 10/9/09; office review 10/21/09

# CITI Collaborative Institutional Training Initiative

**Course In The Protection Human Subjects Curriculum Completion Report**
**Printed on Wednesday, September 10, 2008**

**Learner:** Chih-hsuan Wang (username: wangchi)
**Institution:** Auburn University
**Contact Information**
Education
Psychology
Auburn, Alabama 36849 United States
Phone: 334-444-2863
Email: wangchi@auburn.edu

**Social/Behavioral Research Course:** Choose this group to satisfy CITI training requirements for Investigators and staff involved primarily in biomedical research with human subjects.

**Stage 1. Basic SBR Passed on 09/10/08** (Ref # 2055853)

| Required Modules | Date Completed | Score |
|---|---|---|
| Belmont Report and CITI Course Introduction | 09/01/08 | 2/3 (67%) |
| Students in Research - SBR | 09/08/08 | 10/10 (100%) |
| History and Ethical Principles - SBR | 09/02/08 | 6/7 (86%) |
| Defining Research with Human Subjects - SBR | 09/02/08 | 4/4 (100%) |
| Assessing Risk in Social and Behavioral Sciences - SBR | 09/08/08 | 4/5 (80%) |
| Informed Consent - SBR | 09/09/08 | 4/4 (100%) |
| Privacy and Confidentiality - SBR | 09/09/08 | 3/4 (75%) |
| Research with Children - SBR | 09/09/08 | 4/5 (80%) |
| Internet Research - SBR | 09/10/08 | 5/5 (100%) |
| Auburn University | 09/10/08 | no quiz |

**For this Completion Report to be valid, the learner listed above must be affiliated with a CITI participating institution. Falsified information and unauthorized use of the CITI course site is unethical, and may be considered scientific misconduct by your institution.**

Paul Braunschweiger Ph.D.
Professor, University of Miami
Director Office of Research Education
CITI Course Coordinator

Return

# Appendix B

## Participant Information Letter

# Online Learning Experience

## 1. Information Letter

Dear Student:
You are invited to participate in a research study to understand your experiences in taking online courses. This study is being conducted by Chih-hsuan Wang, a Graduate Student, under the direction of Dr. David Shannon, Distinguished Professor in Auburn University Department of Educational Foundations, Leadership, and Technology. You were selected as a possible participant because you are one of Auburn University students who enrolled in online courses during 2008~2009 academic year.

You have to be 19 years old or older to participate in this study. If you decide to participate, you will be asked to complete and submit an electronic survey. It should take you about thirty minutes to complete the questionnaire. All information will be summarized by groups so that no individual answers will be identified. Also, the responses will be anonymous, and no e-mail address or student ID will be linked to the data returned to the researcher.

If you decide to participate in this study, you can expect to be a part of assisting in increasing understanding students' experiences in online learning courses. There is no risk or cost associated with participating in this study.

After you complete and submit the electronic survey, you will be redirected to another link which you can possibly get a five-dollar gift certification code for Amazon.com or a 10% off coupon for Auburn University Bookstore located at the first floor of Haley Center. All the drawings are random.

If you choose not to participate, you can do so by not clicking the link provided in this letter or by closing out the electronic survey, your data will not be collected. Your participation is completely voluntary. Your decision about whether or not to participate or to stop participating will not jeopardize your future relations with Auburn University or the Department of Educational Foundations, Leadership, and Technology.

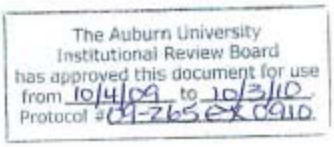
Any information obtained in connection with this study will remain anonymous. Information collected through your participation will be used to fulfill an educational requirement, published in an academic journal, and/or presented at a professional conference. Submitting the questionnaire represents your consent to participate in the study. After the anonymous data has been returned, there will be no way to identify your responses for withdrawal.

If you have any questions, you can contact Chih-hsuan Wang at 334-844-8682, or at wangchi@auburn.edu.
If you have questions about your rights as a research participant, you may contact the Auburn University Office of Human Subjects Research or the Institutional Review Board by phone 334-844-5966 or e-mail at hsubjec@auburn.edu or IRBChair@auburn.edu.

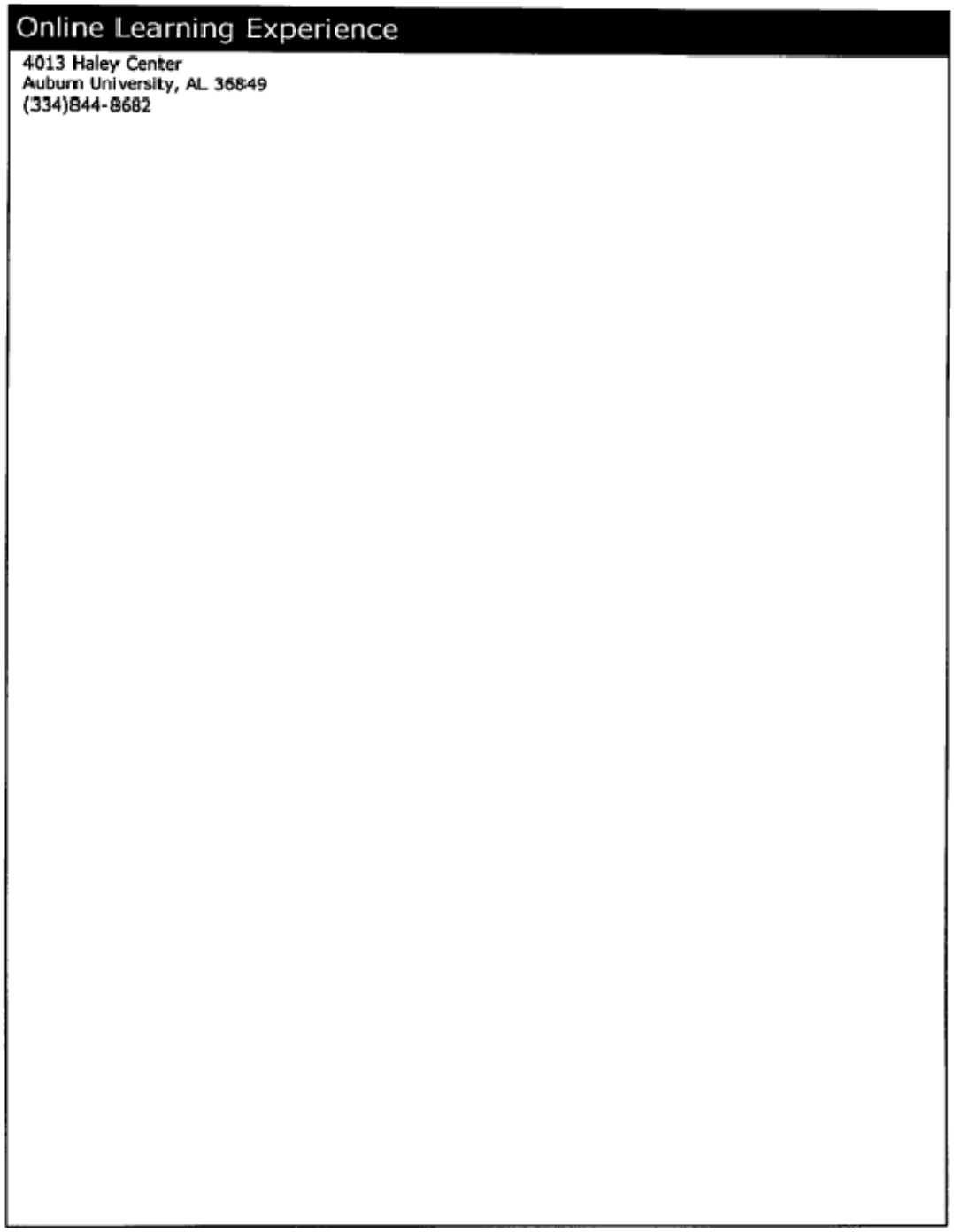
HAVING READ THE INFORMATION PROVIDED, YOU MUST DECIDE IF YOU WANT TO PARTICIPATE IN THIS RESEARCH PROJECT. IF YOU DECIDE TO PARTICIPATE, THE DATA YOU PROVIDE WILL SERVE AS YOUR AGREEMENT TO DO SO. YOU MAY PRINT A COPY OF THIS LETTER TO KEEP.

The Auburn University Institutional Review Board has approved this document for use from October 4, 2009 to October 3, 2010. Protocol #09-265 EX 0910.

Please click the NEXT button to begin the survey. Sincerely,




Chih-hsuan Wang
Auburn University
College of Education
Department of Educational Foundations, Leadership, and Technology


Online Learning Experience
4013 Haley Center
Auburn University, AL 36849
(334)844-8682

# Appendix C

## Survey Instrument

# Online Learning Experience Form B

## 1. Information Letter

Dear Student:
You are invited to participate in a research study to understand your experiences in taking online courses. This study is being conducted by Chih-hsuan Wang, a Graduate Student, under the direction of Dr. David Shannon, Distinguished Professor in Auburn University Department of Educational Foundations, Leadership, and Technology. You were selected as a possible participant because you are one of Auburn University students who enrolled in online courses during 2008~2009 academic year.

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After you complete and submit the electronic survey, you will be redirected to another link which you can possibly get a five-dollar gift certification code for Amazon.com or a 10% off coupon for Auburn University Bookstore located at the first floor of Haley Center. All the drawings are random.

If you choose not to participate, you can do so by not clicking the link provided in this letter or by closing out the electronic survey, your data will not be collected. Your participation is completely voluntary. Your decision about whether or not to participate or to stop participating will not jeopardize your future relations with Auburn University or the Department of Educational Foundations, Leadership, and Technology.

Any information obtained in connection with this study will remain anonymous. Information collected through your participation will be used to fulfill an educational requirement, published in an academic journal, and/or presented at a professional conference. Submitting the questionnaire represents your consent to participate in the study. After the anonymous data has been returned, there will be no way to identify your responses for withdrawal.

If you have any questions, you can contact Chih-hsuan Wang at 334-844-8682, or at wangchi@auburn.edu. If you have questions about your rights as a research participant, you may contact the Auburn University Office of Human Subjects Research or the Institutional Review Board by phone 334-844-5966 or e-mail at hsubjec@auburn.edu or IRBChair@auburn.edu.

HAVING READ THE INFORMATION PROVIDED, YOU MUST DECIDE IF YOU WANT TO PARTICIPATE IN THIS RESEARCH PROJECT. IF YOU DECIDE TO PARTICIPATE, THE DATA YOU PROVIDE WILL SERVE AS YOUR AGREEMENT TO DO SO. YOU MAY PRINT A COPY OF THIS LETTER TO KEEP.

The Auburn University Institutional Review Board has approved this document for use from October 4, 2009 to October 3, 2010. Protocol #09-265 EX 0910.

Please click the NEXT button to begin the survey.

Sincerely,
Chih-hsuan Wang
Auburn University
College of Education
Department of Educational Foundations, Leadership, and Technology

# Online Learning Experience Form B 2010

Auburn University, AL 36849
(334)844-8682

## 2.

* 1. Are you 19 years old or older?

◯ Yes ◯ No

## 3. Learning Strategies in Online Learning

2. What strategies do you use to keep up to date with assignments in this class?

3. What strategies do you use when trying to remember information from class/videos?

4. What strategies do you use when reviewing the materials available through the distance education site (webCT, Blackboard, etc..)

5. What online tools (e.g. ) do you use most often and how are these helpful?

## 4. Using Online Technology

Here are two terms you are going to see in this part of survey:
Asynchronous, indicating that students can participate in the classes by e-mails, discussion boards, or other facilitating media. Therefore, students do not have to be in front of their computers at a specific time. It is a very flexible learning setting.
Synchronous, indicating that students have to participate in the classes at live videoconferencings basis. Therefore, students have to be in front of their computers at a specific time. However, there are more interactions among instructors and students.

## Online Learning Experience Form B 2010

*** 6. I would feel confident...**

| | Not Confident At All | Not Very Confident | Somewhat Confident | Very Confident |
|---|---|---|---|---|
| Signing on and off an asynchronous conferencing system (Discussion Board). | ◯ | ◯ | ◯ | ◯ |
| Replying to a message posted on an asynchronous conferencing system so that all members can view it. | ◯ | ◯ | ◯ | ◯ |
| Bookmarking a web site. | ◯ | ◯ | ◯ | ◯ |
| Loading on and off an e-mail system. | ◯ | ◯ | ◯ | ◯ |
| Sending an e-mail message to a specific person (one-to-one interaction). | ◯ | ◯ | ◯ | ◯ |
| Uploading (sending) a file to an asynchronous conferencing system. | ◯ | ◯ | ◯ | ◯ |
| Reading messages from one or more members of the synchronous chat system. | ◯ | ◯ | ◯ | ◯ |
| Downloading (saving) an image from a web site to a disk. | ◯ | ◯ | ◯ | ◯ |
| Reading text from a web site. | ◯ | ◯ | ◯ | ◯ |
| Downloading (saving) a file from an asynchronous conferencing system to a local disk or external memory device. | ◯ | ◯ | ◯ | ◯ |
| Sending one e-mail message to more than one person at the same time (one person to many person interaction). | ◯ | ◯ | ◯ | ◯ |
| Answering a message or providing my own message in a synchronous chat system (one-to-many interaction). | ◯ | ◯ | ◯ | ◯ |
| Posting a new message to an synchronous conferencing system (creating a new thread). | ◯ | ◯ | ◯ | ◯ |
| Replying to a message posted on an asynchronous conferencing system so that only one member can view it (reply to sender). | ◯ | ◯ | ◯ | ◯ |
| Deleting messages received via e-mail. | ◯ | ◯ | ◯ | ◯ |
| Conducting an Internet search using one or more keywords. | ◯ | ◯ | ◯ | ◯ |
| Replying to an e-mail message. | ◯ | ◯ | ◯ | ◯ |
| Providing a nickname within a synchronous chat system (if necessary). | ◯ | ◯ | ◯ | ◯ |
| Copying a block of text from a web site and pasting it to a document in a word processor. | ◯ | ◯ | ◯ | ◯ |
| Creating an address book. | ◯ | ◯ | ◯ | ◯ |
| Attaching a file (image or text) to an e-mail message and then sending it off. | ◯ | ◯ | ◯ | ◯ |
| Forwarding an e-mail message. | ◯ | ◯ | ◯ | ◯ |
| Reading a message posted on an asynchronous conferencing system (Discussion Board). | ◯ | ◯ | ◯ | ◯ |
| Opening a web browser (e.g. Netscape or Explorer). | ◯ | ◯ | ◯ | ◯ |
| Interacting privately with one member of the synchronous chat system (one-to-one interaction). | ◯ | ◯ | ◯ | ◯ |
| Printing a web site. | ◯ | ◯ | ◯ | ◯ |
| Accessing a specific web site by typing the address (URL). | ◯ | ◯ | ◯ | ◯ |

## Online Learning Experience Form B 2010

| | | | | |
|---|---|---|---|---|
| Saving a file attached to an e-mail message to a local disk and then viewing the contents of that file. | ◯ | ◯ | ◯ | ◯ |
| Clicking on a link to visit a specific web site. | ◯ | ◯ | ◯ | ◯ |

### 5. Motivation

*** 7. The following statements relate to your attitudes toward online classes at Auburn University. If you have completed more than one online class, please respond to these statements as they pertain to the class you most recently completed. Using the scale to the right of each statement, select the answer that best describes you. Remember there are no right or wrong answers, just respond as best you can. If you think the statement is very true of you, select 7; if a statement is not at all true of you, select 1. If the statement is more or less true of you, find the number between 1 and 7 that best describes you.**

| | NOT at all TRUE of me 1 | 2 | 3 | 4 | 5 | 6 | VERY TRUE of me 7 |
|---|---|---|---|---|---|---|---|
| It is important for me to learn the course material in this class. | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ |
| I believe I will receive an excellent grade in this class. | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ |
| I'm certain I can understand the most difficult material presented in the readings for this course. | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ |
| I think I will be able to use what I learn in this course in other courses. | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ |
| When I take tests I think of the consequences of failing. | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ |
| Understanding the subject matter of this course is very important to me. | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ |
| When I take a test I think about items on other parts of the test I can't answer. | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ |
| I feel my heart beating fast when I take an exam. | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ |
| I'm confident I can learn the basic concepts taught in this course. | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ |
| Considering the difficulty of this course, the teacher, and my skills, I think I will do well in this class. | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ |
| I'm confident I can do an excellent job on the assignments in this course. | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ |
| I am very interested in the content area of this course. | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ |
| I like the subject matter of this course. | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ |
| I'm confident I can understand the most complex material presented by the instructor in this course. | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ |
| I'm certain I can master the skills being taught in | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ |

## Online Learning Experience Form B 2010

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| When I take a test I think about how poorly I am doing compared with other students. | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| I think the course material in this class is useful for me to learn. | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| I have an uneasy, upset feeling when I take an exam. | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| I expect to do well in this class. | ○ | ○ | ○ | ○ | ○ | ○ | ○ |

## 6. Course Satisfaction Questionnaire

*** 8. We are interested in your general satisfaction with the course you have just completed. Please rate your level of satisfaction with the following aspects of the course:**

| | Completely Dissatisfied 1 | 2 | 3 | 4 | 5 | 6 | Completely Satisfied 7 |
|---|---|---|---|---|---|---|---|
| The time it took for your instructor to provide feedback on graded assignments. | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| The format of the different assignments. | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| The quality of interaction between you and your instructor. | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| The teaching style of your instructor. | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| The extra learning resources provided to you (e.g. extra handouts, on-line resources, list of frequently asked questions, on-line discussion groups, on-line weekly quizzes). | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| The increase in your knowledge and/or skills as a result of this course. | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| The instructor in terms of his devotion to the course. | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| The quality of the feedback provided on graded assignments. | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| The assistance given by the instructor in completing the course successfully. | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| The manner in which guidelines were given on the completion of assignments. | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| The reminders given to you about assignments due. | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| The lecture notes provided to you. | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| The increase in your confidence in using the knowledge and/or skills as a result of this course. | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| The amount of interaction between you and your instructor. | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| The accommodation of your approach to learning in the way this course was taught. | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| The learning value of the assignments. | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| The options available to you to hand in assignments. | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Access to your grades during the semester. | ○ | ○ | ○ | ○ | ○ | ○ | ○ |

## Online Learning Experience Form B 2010

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| The manner in which the syllabus was distributed. | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ |
| The logical organization of the course content. | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ |
| The cooperation between you and your classmates. | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ |

## 7. Learning Strategies

*** 9. The following statements relate to your learning strategies and study skills for online classes at Auburn University. If you have completed more than one online class, please respond to these statements as they pertain to the class you most recently completed. Using the scale to the right of each statement, select the answer that best describes you. Again, there are no right or wrong answers, just respond as best you can. If you think the statement is very true of you, select 7; if a statement is not at all true of you, select 1. If the statement is more or less true of you, find the number between 1 and 7 that best describes you.**

| | NOT at all TRUE of me 1 | 2 | 3 | 4 | 5 | 6 | VERY TRUE of me 7 |
|---|---|---|---|---|---|---|---|
| I rarely find time to review my notes or readings. | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ |
| When studying for this course I try to determine which concepts I don't understand well. | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ |
| I have a regular place set aside for studying. | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ |
| When reading for this class, I try to relate the material to what I already know. | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ |
| Before I study new course material thoroughly, I often skim it to see how it is organized. | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ |
| While I'm online for this class I often miss important points because I'm thinking of other things. | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ |
| If course readings are difficult to understand, I change the way I read the material. | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ |
| I often find that I have been reading for this class but don't know what it was all about. | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ |
| If I get confused during online activities, I make sure I sort it out afterwards. | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ |
| When I study for this class, I set goals for myself in order to direct my activities in each study. | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ |
| I make good use of my study time for this course. | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ |
| When reading for this course, I make up questions to help focus my reading. | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ |
| I ask myself questions to make sure I understand the material I have been studying in this class. | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ |
| When I become confused about something I'm reading for this class, I go back and try to figure it out. | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ |

## Online Learning Experience Form B 2010

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| I often find that I don't spend very much time on this course because of other activities. | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ |
| 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 for this course. | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ |
| When I study for this class, I pull together information from different sources, such as readings, online discussions, and my prior knowledge of the subject. | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ |
| I login to Blackboard/WebCT for this class regularly. | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ |
| I try to change the way I study in order to fit the course requirements and the instructional methods used in this class. | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ |
| When I study for this course, I write brief summaries of the main ideas from the readings and online discussions. | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ |
| I try to play around with ideas of my own related to what I am learning in this course. | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ |
| When a theory, interpretation, or conclusion is presented in the online discussions or in the readings, I try to decide if there is good supporting evidence. | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ |
| I try to relate ideas in this subject to those in other courses whenever possible. | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ |
| Whenever I read an assertion or conclusion in this class, I think about possible alternatives. | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ |
| I usually study in a place where I can concentrate on my course work. | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ |
| I often find myself questioning things I hear or read in this course to decide if I find them convincing. | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ |
| I find it hard to stick to a study schedule. | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ |
| I treat the course material as a starting point and try to develop my own ideas about it. | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ |
| I try to understand the material in this class by making connections between the readings and the concepts from the online activities. | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ |
| I make sure that I keep up with the weekly readings and assignments for this course. | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ |
| I try to apply ideas from course readings in other class activities such as online discussions. | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ |

## 8. Demographics Questions

* **10. What is the highest level of education you have completed?**

* **11. What is your age?**

## Online Learning Experience Form B 2010

* 12. Are you female or male?

13. What is your ethnicity?

* 14. In which college are you enrolled?

* 15. How many online courses have you completed in your current academic program in the past 12 months?

* 16. How many online courses have you completed in total in your current academic program?

* 17. Are you currently enrolled in an online course?

* 18. When did you complete your most recent online course?

* 19. What was your grade of your most recent online course?

* 20. What is your GPA?

**9.**

This is the end of the survey. Thank you very much.

# Appendix D

## Survey Invitation E-mails

**From:** Chih-hsuan Wang
**To:** wangchi@auburn
**Date:** 10/21/2009 2:44 PM
**Subject:** AU Students Survey Invitation

Dear AU Student:

My name is Chih-hsuan Wang, and I am a doctoral student in Educational Psychology. I am completing my dissertation research about online learning experiences under the supervision of Dr. David Shannon, Distinguished Professor in Auburn University Department of Educational Foundations, Leadership, and Technology. You are invited to participate in a dissertation study to understand your experiences in taking online course. You were selected as a possible participant because you are one of Auburn University students who enrolled in online courses during 2008~2009 academic year.

In next week, you will receive another e-mail containing the link that will take you to the survey. Your input is needed and greatly appreciated as we all participate in research that could help future students, researchers, and course designers understand the students' experiences in online courses.

Sincerely,
Chih-hsuan Wang
Auburn University
College of Education
Department of Educational Foundations, Leadership, and Technology
4013 Haley Center
Auburn University, AL 36849
(334)844-8682

**From:** Chih-hsuan Wang
**To:** wangchi@auburn.edu
**Date:** 10/21/2009 2:47 PM
**Subject:** AU Students Survey Invitation

Dear AU Student,

My name is Chih-hsuan Wang, and I am a doctoral student in Educational Psychology. I am completing my dissertation research about online learning experiences under the supervision of Dr. David Shannon, Distinguished Professor in Auburn University Department of Educational Foundations, Leadership, and Technology. You are invited to participate in a dissertation study to understand your experiences in taking online course. You were selected as a possible participant because you are one of Auburn University students who enrolled in online courses during 2008~2009 academic year.

I am doing this research to learn more about the aspects of online learning that are more beneficial to students and the types of strategies students use in online courses. Your responses to this survey will help instructors understand which aspects of online courses are most important. In addition, you will help other students by describing strategies you have used successfully in online courses.

You have to be 19 years old or older to participate in this study. If you decide to participate, you will be asked to complete and submit an electronic survey. It should take you about thirty minutes to complete the questionnaire. All information will be summarized by groups so that no individual answers will be identified. Also, the responses will be anonymous, and no e-mail address or student ID will be returned to the researcher.

After you complete and submit the electronic survey, you will be redirected to another link which you can possibly get a five-dollar gift certification code for Amazon.com or a 10% off coupon for Auburn University Bookstore located at the first floor of Haley Center. All the drawings are random.

If you choose not to participate, you can do so by closing out the electronic survey, your data will not be collected. Your participation is completely voluntary. Your decision about whether or not to participate or to stop participating will not jeopardize your future relations with Auburn University or the Department of Educational Foundations, Leadership, and Technology.

You may access the survey on the Internet at the following site:
http://www.surveymonkey.com/s.aspx?sm=dr91_2fArkGEPEGHctQl2hTw_3d_3d

Thank you for your assistance.

Sincerely,
Chih-hsuan Wang
Auburn University
College of Education
Department of Educational Foundations, Leadership, and Technology
4013 Haley Center
Auburn University, AL 36849
(334)844-8682

# Appendix E

## Survey Reminders

**From:** Chih-hsuan Wang
**To:** Chih-hsuan Wang
**Date:** 10/23/2009 10:54 AM
**Subject:** Feedback on AU Online Courses A

Dear AU Student:

Last week, you received an e-mail notice asking you to participate in a research project that explorers your online learning experiences. If you have completed the survey, I thank you for this valuable feedback. If you have not yet had an opportunity to fill out the survey, please take a few minutes to respond. I want your input to help refine distance education at Auburn University.

You can access the survey at:

http://www.surveymonkey.com/s.aspx?sm=auNKbuxOPx8WU79o8Sq9iq_3d_3d

If for any reason you are having trouble accessing the survey, please contact me.

Thank you for your assistance.

Sincerely,
Chih-hsuan Wang
Auburn University
College of Education
Department of Educational Foundations, Leadership, and Technology
4013 Haley Center
Auburn University, AL 36849
(334)844-8682

**From:** Chih-hsuan Wang
**To:** Chih-hsuan Wang
**Date:** 11/10/2009 10:44 PM
**Subject:** Feedback on AU Online Courses A2-------You can WIN one of 20 Amazon.com gift cards!!!

Dear AU Student:

You can win one of 20 Amazon.com gift cards!

Just complete the survey and copy-paste the link provided on Thank You page and you have a good chance of winning a gift card. Twenty of the next 200 participants will win one an Amazon.com gift card. If you have completed the survey, but did not have the chance to participate the raffle, please e-mail me, and I will send you the link.

Your feedback about your experiences in online classes at Auburn is valuable. If you have already completed the survey, I thank you for this valuable feedback. If you have not yet had an opportunity to fill out the survey, please take a few minutes to respond. I want your input to help refine distance education at Auburn University.

You can access the survey at:

http://www.surveymonkey.com/s.aspx?sm=auNKbuxOPx8WU79o8Sq9iq_3d_3d

If for any reason you are having trouble accessing the survey, please contact me.

Thank you for your assistance.

Sincerely,
Chih-hsuan Wang
Auburn University
College of Education
Department of Educational Foundations, Leadership, and Technology
4013 Haley Center
Auburn University, AL 36849
(334)844-8682

Appendix F

Thank You Page


## Online Learning Experience Form A

Thank you for participating in this important survey. The results will help all of us better understand students' online learning experiences.

Here is the coupon code for the Auburn University Bookstore: "10off".

It will allow you a 10% discount on general merchandise purchase at Auburn University Bookstore.

http://www.aubookstore.com/shop_main.asp?
mscssid=C59A13CDE9E841DA83B941162B0194FE

Please print or save this page so you can use the promotion code in your next Auburn University Bookstore purchase.

Please copy and paste the following link:
https://oitappstest.auburn.edu/Eric/Drawing/default.aspx
to participate the raffle for $5.00 Amazon.com gift certificate.

Done >>

Appendix G

Raffle Page

If you are interested in drawing for Amazon coupon, please enter your Auburn E-mail (XXXXXXX@AUBURN.EDU) here. (E-mail won't be linked to the survey you just filled)

Submit