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Factor Analysis of Online Instruction Self-Efficacy Using the Tennessee Online Instruction Survey

Frederick Augustus Randall
University of Tennessee - Knoxville

To the Graduate Council:

I am submitting herewith a dissertation written by Frederick Augustus Randall entitled "Factor Analysis of Online Instruction Self-Efficacy Using the Tennessee Online Instruction Survey." I have examined the final electronic copy of this dissertation for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy, with a major in Human Ecology.

Gregory C. Petty, Major Professor

We have read this dissertation and recommend its acceptance:

Ernest W. Brewer, Jacquelyn O. DeJonge, Gene A. Hayes

Accepted for the Council:

Carolyn R. Hodges

Vice Provost and Dean of the Graduate School

(Original signatures are on file with official student records.)

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Accepted for the Council:

Vice Provost and Dean of
Graduate Studies

FACTOR ANALYSIS OF ONLINE INSTRUCTION SELF-EFFICACY USING THE TENNESSEE ONLINE INSTRUCTION SURVEY

A Dissertation
Presented for the
Doctor of Philosophy
Degree
The University of Tennessee, Knoxville

Fredrick Augustus Randall
December 2001

DEDICATION

This dissertation is dedicated to my grandfather, Ira Chester Akins,

who died during my studies at the University of Tennessee.

His devotion to family, compassion, and ability to coax

a bull bream to his line were inspirational

and he is missed.

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While the dissertation is an individual accomplishment, it does not occur in a vacuum, or without support. Many people contributed directly to the completion of this study and others were indirectly responsible for me undertaking and completing this task.

I must thank my doctoral committee for assistance in this endeavor. Dr. Gregory Petty, my major professor, and other committee members, Dr. Ernest Brewer, Dr. Jacky DeJonge, and Dr. Gene Hayes provided excellent guidance in this process. Specifically, I thank Dr. Petty for always being mindful of finding new experiences for me. Dr. Ernest Brewer also deserves much credit for his editorial skills, attention to detail, and commitment to educational excellence. Finally, Dr. Gene Hayes has earned my thanks for many years of support and friendship to both my wife and me.

I also express my appreciation to the National Joint Apprenticeship and Training Committee (NJATC) for supporting this research, and to the Department of Human Resource Development and College of Human Ecology for financial support as a graduate teaching associate while I pursued this degree.

My family has been very important to me during my college career and deserves recognition. My mother and father, Rene Fuqua and Thomas Randall, and my grandmother, Willadene Akins, have been wonderfully supportive during this process. I could not have reached this moment without them.

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ABSTRACT

As the use of online instruction continues to rise in post-secondary education and corporate training, a better understanding of one's beliefs, attitudes, and confidence regarding online instruction is necessary to increase the quality and effectiveness of online instruction. This study investigated self-efficacy beliefs related to online instruction. Self-efficacy, a psychological construct, is defined as self-appraisal of one's capabilities to plan and undertake a course of actions required for a specified task.

The objectives of this study were to (a) develop a survey instrument to measure the psychological construct of self-efficacy related to online instruction; (b) identify the salient factors of online instruction self-efficacy through the use of exploratory factor analysis; and (c) determine the significance of subjects' demographic variables in relation to online instruction self-efficacy beliefs.

To accomplish these goals a theoretical model of the online instruction self-efficacy was developed based on a review of literature and expert review and used to create an assessment of online instruction self-efficacy beliefs termed the Tennessee Online Instruction Survey (TOIS). The TOIS was examined for face validity, pilot tested, revised, and finally tested with a sample of 762 electrician instructors from the National Joint Apprenticeship and Training Committee (NJATC) during their National Training Institute (NTI) in August 2001.

Exploratory factor analysis resulted in a three-factor solution that accounted for 68.7% of the variance found in the sample data and provided an interpretable theoretical model of online instruction self-efficacy. Internet/technology behaviors, collaborative behaviors, and individual behaviors were the three underlying factors found for this data

set. MANOVA procedures and the Tukey-Kramer post-hoc test were used to examine the significance of several demographic variables in relation to reported self-efficacy beliefs.

It was concluded that the goals and objectives set for this study were met. Though requiring additional testing and refinement, the TOIS offered high internal reliability and content validity, and was concluded to be a reasonable psychometric assessment tool for online instruction self-efficacy.

The three-factor model of online instruction self-efficacy found through exploratory factor analysis in this study must be refined and validated with other populations to gain a greater understanding of the usefulness of the TOIS to educational practice. Additional findings, conclusions, implications, and recommendations regarding this instrument and population are also discussed.

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CHAPTER I

Introduction

Online instruction is an emerging trend in educational practice (Berge, 1997; Cheurprakobkit, 2000; Driscoll, 1999; Harasim, 1990; Harrison, 1999; Khan, 1997; Lord, 2001; Owston, 2000; Palloff & Pratt, 1999; Shomaker, 1998; Verduin & Thomas, 1991; Wernet, Olliges, & Delicath, 2000). The use of computers in educational instruction is not new, and the use of computer technology in distance education, facilitation of communication, and classroom augmentation is increasingly common (Barnard, 1997). In the academic arena, about two-thirds of the 3,200 accredited 4-year colleges and graduate schools in the United States now offer online instruction (Clarke, 1999). On the corporate side, online instruction and training has become a $2.3 billion market and is expected to grow at 50% annually and top $18 billion in 2005 (Lord, 2001). Currently, the technology has increased sufficiently to allow the beginnings of instruction using the Internet as a means of facilitating the entire learning experience without entering a physical classroom. This emerging instructional technique is already being implemented in university and corporate settings, yet the characteristics of online instruction and its impact on student learning have not been fully examined (Arbaugh, 2000; Hargis, 2001; Harriman & Fitz Gibbon, 2000; Human, Kilbourne, Clark, Shriberg, & Cunningham, 1999; Shedletsky & Aitken, 2001; Piotrowski & Vodanovich, 2000).

Beliefs about personal capability to plan and complete required actions is the basis of self-efficacy, a psychological construct proposed by Bandura (1977). Bandura (1977, 1986, 1997) reported that self-efficacy judgments could influence choice of activities, the level of effort exerted, persistence in difficult situations, and performance.

Personal confidence often influences behavior; people engage in activities that they feel confident they can undertake and avoid activities when uncertain of their ability to perform well. The increased use of online instruction necessitates investigation of learners' beliefs, attitudes and confidence regarding the use of this instructional technology. Therefore, the basic relationship between beliefs and action is particularly important to online instruction. The technology used in online instruction is unfamiliar, novel, is an area of rapid change, and offers both benefits and barriers to the educational process (Boser, 2001; Rodes, Knapczyk, Chapman, & Chung, 2000; Wernet, Olliges, & Delicath, 2000). It has been hypothesized that a person's knowledge, skills, and prior achievements may be poor predictors of how they will do in ensuing experiences due to these mediating self-evaluations (Bandura, 1997). Therefore, a person's previous educational experiences may not be indicative of experiences in online instruction since the person's self-efficacy beliefs regarding online instruction will mediate their actions during the learning experience, and ultimately, effect their performance and the outcomes of the experience.

Three objectives were established for this study:

1. To develop the TOIS instrument based on a review of the literature and expert review to measure self-efficacy beliefs regarding one's ability to participate in online instruction.

2. To derive a statistical model of the salient factors underlying self-efficacy and the online instructional experience using exploratory factor analysis.

3. To determine the relevance of the subject's demographic variables related to their online instruction self-efficacy beliefs using statistical procedures.

Rationale and Need for the Study

The dependence of online instruction on technology necessitates evaluation of the learners' self-efficacy judgments regarding their capability to successfully perform in this new educational environment. Not only are the challenges of learning in a traditional class present, there are technological skills necessary in online instruction. This type of instruction may also present new challenges for learners inherent to the structure of online learning. For example, the ability of the learner to regulate their regular participation in the class may be greater without the structure of attending a physical classroom. Additionally, activities that would occur in a traditional classroom may be significantly changed. Instead of verbally asking the instructor a question, receiving verbal feedback from the instructor, or physically meeting with a peer group to complete a group project, students may be required to wholly use text-based computer conferencing.

While the self-efficacy construct has been examined in academic settings (Kinzie, Delcourt, & Powers, 1994; Madorin & Iwasiw, 1999; Pajares, 1996; Zimmerman, 1995), few studies (Jiang, 1998; Reinhart, 1999) have investigated self-efficacy related to online instruction and no comprehensive, multidimensional survey instrument assessing self-efficacy beliefs concerning online instruction could be found in the literature. Consequently, no analyses of variable structure for online instruction self-efficacy were available for examination. To better understand learners' involvement in online learning experiences, this study developed a survey instrument to assess perceived capability in a variety of online instructional tasks with different levels of task demand. The perceptions of the capability is essential to both the appropriate development of online courses and

the preparation of students to successfully learn from this new delivery system. Moreover, an understanding of the salient characteristics and variable relationships for online instruction self-efficacy, as measured by the survey instrument would add to the limited knowledge of this new educational delivery system.

Conceptual and Theoretical Framework for the Study

A conceptual and theoretical framework, as seen in Figure 1, was developed for this research endeavor to guide the focus of this study: The development and factor analysis of a survey instrument designed to assess online instruction self-efficacy. The conceptual framework for this study was based on social cognitive theory, proposed by Bandura (1977, 1986, 1997), which attributes human behavior to the interaction of three determinants: (a) behavior, (b) environmental forces, and (c) personal factors. Bandura termed this interaction triadic reciprocality or reciprocal determinism. The theoretical framework for this study was based on three areas relevant to the development of an assessment of online instruction self-efficacy: (a) the psychological construct, self-efficacy (Bandura, 1997), and its usefulness in evaluating learners' beliefs regarding participating in online instructional experiences, (b) identified components of the domain of online instruction, and (c) psychometric theories related to the development, factor analysis, and demographic analysis of the TOIS. While self-efficacy beliefs were the focus of this study, the specific area of interest for these beliefs was online instructional experiences. Hence, the theoretical framework for the proposed study focused on the psychological construct of self-efficacy related to the components and features specific to online instructional practice (Khan, 1997). This theoretical framework, along with other

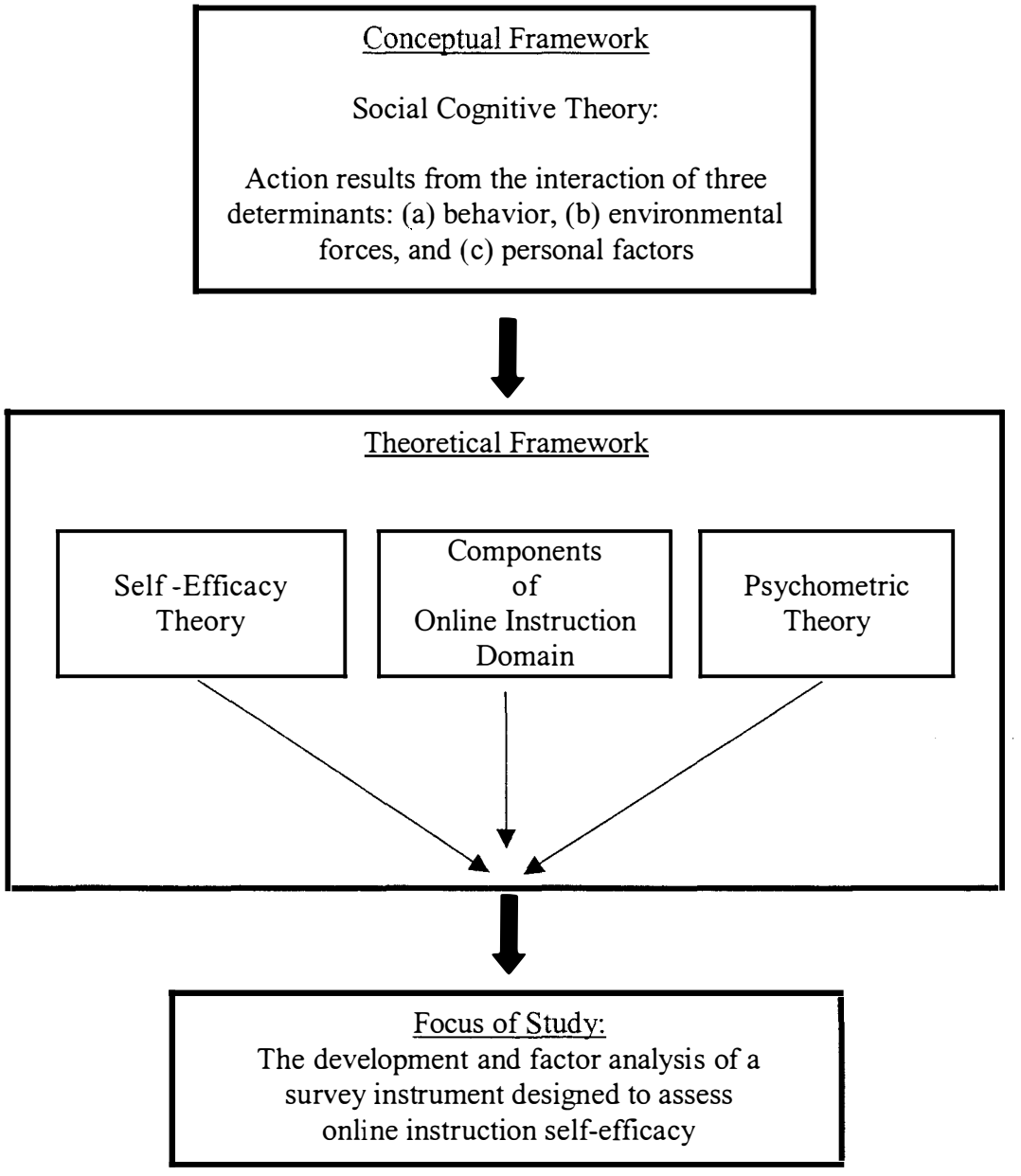

Figure 1
Conceptual and theoretical framework for study.

literature and expert review, was used to generate a theoretical model (Figure 2) of components relevant to an online instruction self-efficacy instrument, which was used to develop a survey instrument. This theoretical model included components of computer self-efficacy, online activities, instructional elements / learning modes, communication / collaboration, and self-regulatory skills. These concepts will be discussed further in the review of literature.

Statement of the Problem

Understanding the online instructional process requires an evaluation of the learners' reaction to this nontraditional delivery method, and the effect of this new delivery system on the performance of the learner. The self-efficacy construct has been examined in relation to computer skills (Buhendwa, 1996; Carlson & Grabowski, 1992, Compeau, Higgins & Huff, 1999; Decker, 1996; Delcourt & Kinzie, 1993; Ertmer,

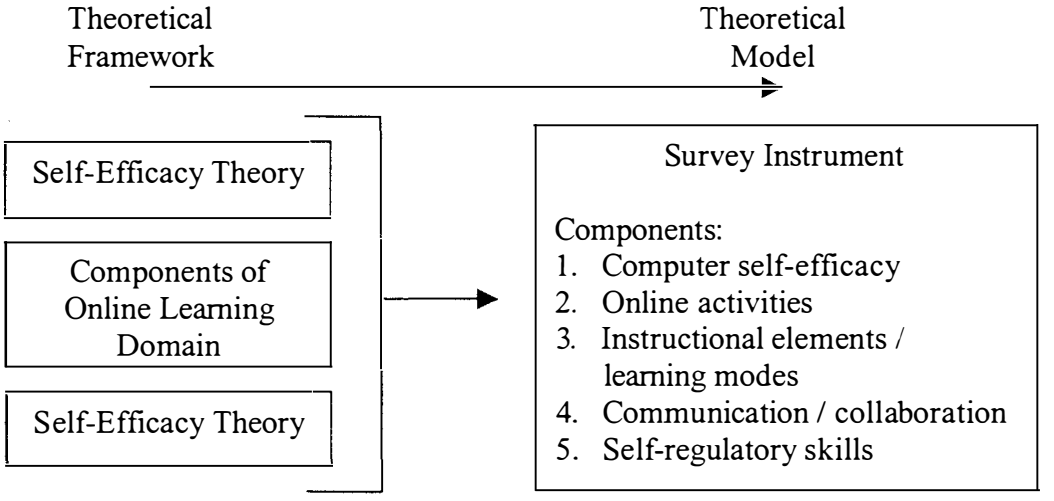

Figure 2
Theoretical framework and model for the study.

Evenbeck, Cennamo & Lehman, 1994; Kinzie & Delcourt, 1991; Murphy, Coover & Owen, 1989), as well as academic settings (Kinzie, Delcourt, & Powers, 1994; Madorin & Iwasiw, 1999; Pajares, 1996; Zimmerman, 1995), and a few studies have addressed online learning self-efficacy (Jiang, 1998; Reinhart, 1999), however no comprehensive model of online instruction assessing the self-efficacy beliefs under different levels of task demand was found in the literature. With the increased use of online instruction in educational and corporate settings this instructional technique must be more fully explored, and this study was designed to help fill that gap in knowledge.

Research Questions

The primary research goals guiding this study focused on the development and statistical analysis of an assessment of online instruction self-efficacy. To achieve the goals of this study, the following main research questions were:

Q1: What are the salient factors of online instruction self-efficacy?

Q2: Do the self-efficacy beliefs of instructors change significantly for the demographic variables of gender, age, educational achievement, extent of computer experience, extent of personal online instruction learning experiences, and extent of Internet experiences for the sample data?

Research Hypotheses

While factor analysis procedures were used to examine the first research question, six research hypotheses were developed to answer the second question. Specifically, to examine the comparisons between the dependent variables (the items of the TOIS and derived factors) and independent variables (demographic variables), the null hypotheses for this study are as follows and will be tested at the .05 level of significance:

H_o1: There is no significance difference in online instruction self-efficacy beliefs regarding gender as measured by the TOIS among subjects.

H_o2: There is no significance difference in online instruction self-efficacy beliefs regarding age as measured by the TOIS among subjects.

H_o3: There is no significance difference in online instruction self-efficacy beliefs regarding educational achievement as measured by the TOIS among subjects.

H_o4: There is no significance difference in online instruction self-efficacy beliefs regarding extent of computer experience as measured by the TOIS among subjects.

H_o5: There is no significance difference in online instruction self-efficacy beliefs regarding extent of online instruction learning experiences as measured by the TOIS among subjects.

H_o6: There is no significance difference in online instruction self-efficacy beliefs regarding extent of Internet experience as measured by the TOIS among subjects.

Assumptions, Limitations and Delimitations of the Study

A variety of suppositions and restrictions have been specified for this study based on the characteristics of the study including the topic of online instruction, the theoretical construct of self-efficacy, selected methodologies, and the specific population used. These guiding principles are discussed in categories of assumptions, limitations, and delimitations.

Assumptions

In designing this study, the following assumptions were made:

1. Assessing personal beliefs and belief in abilities using a paper-and-pencil survey instrument is a valid and reliable method of assessment.

2. The participants would respond accurately on the survey instrument.

3. The data from this study would be accurately recorded, subject to the data verification procedure described in Chapter 3, and will be accurately analyzed.

4. The administration of the survey instrument in the data collection phase would be roughly analogous in each training class.

5. The procedures, theoretical framework, and findings would have some degree of applicability and generalizability to other populations involved with online instruction.

Limitations

This study had several limitations based on the conditions and methodology of the study, or uncontrollable characteristics that may have affected the outcomes. These were set as follows:

1. The instrument designed in this study did not provide highly specific information and did not actually measure abilities.

2. Behavior is a complex phenomenon. The instrument designed in this study did not investigate variables other than self-efficacy that might be important to participating in online instruction. This study was limited to the assessment of self-efficacy and its related variables and no attempt was made to assess / control for other variables.

3. The procedures used for this study focused on internal consistency and reliability rather than external validity.

4. This study was restricted to self-reported data only and was limited by the respondent's awareness of their self-efficacy beliefs.

5. Respondents were assumed to have understood the instrument items and honestly and accurately reported their beliefs, demographic features and related experiences.

6. Respondents' abilities to deduce their self-efficacy beliefs towards online instruction were a limit of this study if they had no direct experience with online instruction.

7. The instrument designed in this study was limited to only a face validity examination during the instrument development stage.

8. This study was limited to subjects who voluntarily agreed to participate.

Delimitations

Several restrictions were placed on the study to narrow the scope of the research to the objectives set for the study. These delimitations included:

1. This study used a sample from a single population that might engage in online instruction. Online instruction self-efficacy beliefs will need to be assessed with other populations in other research.

2. There may be variables that effect online instruction self-efficacy other than those components chosen for representation in the survey instrument. This study was delimited to the components of online instruction self-efficacy identified in the review of related literature.

3. This study was delimited to the items decided upon for the final survey instrument, and furthermore, the subsequent statistically analysis only included item analysis of variables salient factors identified in the exploratory factor analysis stage.

4. This study was delimited to the assessment of online instruction self-efficacy beliefs. No attempt was made to determine its prediction of actual online instruction performance or outcomes.

5. This study was delimited to a preliminary investigation of content validity and an examination of face validity of the instrument. While both construct validity and criterion-related validity are important to a online instruction self-efficacy survey instrument, these validation requirements need to be investigated in future research projects.

6. The statistically methods and procedures used in this study were descriptive, and not inferential, in nature (Nunnally & Bernstein, 1994). Since this study employed a purposive, non-probability sampling method, statements regarding generalizations from the sample to the population may not be appropriate.

Definition of Terms

The following section introduces a variety of terms that are used in this study and are elaborated upon in the review of literature.

1. Computer-Mediated Conferencing (CMC) – direct human-to-human communication with the computer acting as a route for the transaction, providing storage and retrieval, and occurring either in synchronous or asynchronous fashion (Berge, 1995).

2. Computer Self-Efficacy – an individual's perceptions of their capability related to specific computer-related knowledge and skills (Murphy, Coover, & Owen, 1989).

3. Distance Education – a non-traditional educational delivery system allowing noncontiguous, two-way interaction between learners and instructors using technology to mediate communication (Garrison & Shale, 1987).

4. Entering Motivation – the motivational states involved in beginning or committing to participate in a learning event (Garrison, 1997).

5. Factor Analysis – a broad category of statistical approaches to determine the structure of relations among variables. Exploratory factor analysis is a particular data-driven (versus theory-driven) approach which attempts to describe the underlying factor structure of a group of variables, indicate which variables belong to which factor, and specify the number of factors needed to explain the relationships (Nunnally & Bernstein, 1994).

6. Metacognition – "...involves thoughts about one's cognitive activities rather than simply higher order cognitive skills" (Bandura, 1997, p. 223). Metacognition is related to the construct of self-regulation and includes cognitive assessment and control of thinking using self-regulative and self-reflective thought (Bandura, 1997).

7. Online Instruction – "...a hypermedia-based instructional program which utilizes the attributes and resources of the World Wide Web to create meaningful learning environments where learning is fostered and supported" (Kahn, 1997, p. 6).

8. Online Instruction Self-Efficacy – As operationally defined for the purpose of this study, is an individual's belief in their capabilities to plan and carry out learning activities that wholly occur over the Internet and World Wide Web under specific conditions.

9. Outcome Expectancy - a judgment of the likely consequence that will result from a particular action or performance (Bandura, 1997).

10. Self-Directed Learning - a process in which the learner takes responsibility for their own learning, including examining their learning needs, developing objectives, designing their learning experiences, finding resources, and

evaluating the learning outcomes (Hatcher, 1997).

11. Self-Efficacy – an individual's confidence in their ability to organize and execute the courses of actions needed to successfully complete a task under a given set of conditions (Bandura, 1977, 1997).

12. Self-Regulation – the degree that learners are metacognitively, motivationally, and behaviorally active participants in the process of their learning (Zimmerman & Kovach, 1996).

13. Task Motivation – the motivational states related to continuing and persisting in a learning event (Garrison, 1997).

14. Tennessee Online Instruction Survey (TOIS) – A psychometric tool, designed for this study, to assess self-efficacy beliefs related to participating in online instruction, according to guidelines presented by Bandura (1997).

15. Triadic Reciprocality (also called Reciprocal Determinism) – a concept from social cognitive theory (Bandura, 1997) that described behavior as being codetermined by individuals and their environments. Individuals partly determine their own behavior as they interpret results of previous behavior, which alters their environments and their beliefs of their capabilities, resulting in changes in subsequent performances. More simply defined, triadic reciprocality is the mutual interaction of behavior, personal factors, and the environment as codeterminants of human behavior (Bandura, 1997).

Summary

This preface introduced the psychological construct of self-efficacy and its proposed usefulness in investigating the fledgling educational practice of online instruction. The guidance of a theoretical framework in developing and exploring the factor structure of a survey instrument was presented. This section also described the rationale and need for the study and provided a discussion of the problem investigated in this study. The assumptions, limitations and delimitations were provided as guidelines used in this study. Finally, a series of definitions for important terms encountered in the study was given.

CHAPTER II

Review of the Literature

The review of literature for this study examines the body of academic knowledge related to developing a measure of online learning self-efficacy beliefs and is divided into four major sections:

1. The first section is a historical overview of the theory and research literature, which examines social cognitive theory and self-efficacy theory in detail. Also, the evolution of distance education and the development of online instruction are reviewed.

2. The theory and research specific to the development and testing of an online instruction self-efficacy instrument is presented in the second section. The current theory and research regarding online instruction, current measures of self-efficacy for computer skills, and past and current research of computer self-efficacy are discussed.

3. Theory and research in cognate areas relevant to online instruction self-efficacy is considered in this section. These related topics include self-directed learning, self-regulation in learning, and collaborative learning.

4. Finally, a critique of the validity of self-efficacy theory and the research literature is offered.

Additionally, a summary of the findings of this literature review, including what is known and unknown about self-efficacy related to online instruction, is offered. Finally, the contributions of this study to the literature of online instruction and the self-efficacy literature will be considered.

Historical Overview of the Theory and Research Literature

Several important areas of academic study impact the eclectic theoretical background used in this study. The base theory for this study was Bandura's social cognitive theory and self-efficacy theory, which is explored in detail. The review also

considers self-efficacy research related to learning and the evolution of distance education in relation to online instruction.

Social Cognitive Theory

The conceptual framework for this study is based upon social cognitive theory and the self-efficacy construct proposed and expanded upon by Albert Bandura (1977, 1986, 1997). In this study, social cognitive theory and self-efficacy (the conceptual framework) were used to guide the instrument development procedure along with related online instruction concepts and principles (theoretical framework).

Social cognitive theory is a widely accepted and empirically validated model of human behavior (Bandura, 1997). In the past, theories of learning focused on two different views, the behaviorist and the cognitivist interpretations of behavior. The behaviorist view emphasized environmental conditions (stimuli) as determinants of overt behaviors (responses), while the cognitivist view focused on how individuals perceived, processed, interpreted, and stored information about their environment and used that information to plan their behaviors (Caffarella, 1999). Social cognitive theory combines some ideas of both these views into a model that proposed behavior as being codetermined by environmental forces, personal factors and performance (Bandura, 1997). In social cognitive theory, human behavior results from the interaction of three determinants: (a) behavior, (b) environmental forces, and (c) personal factors. These determinants mutually interact and influence each other over time, which was referred to by Bandura as triadic reciprocality or reciprocal determinism. In his model of human behavior, individuals engage and alter the environments they exist in, which in turn influences the individual's personal factors.

Additionally, environmental conditions shape an individual's behavior in a particular situation and the environment is in turn effected by behavior. Finally, personal and cognitive factors influence behavior and the performances of the individual reshape the individual's cognition and affect. The reciprocity of these three components is not necessarily of equal strength, nor do the changes in the structures take place immediately (Bandura, 1997).

Behavior in this model is defined as intentional action. Human behavior is not reduced to reactions to environmental conditions, but is determined by a variety of interacting factors including personal control and choice. In addition, behavior is distinguished from the intended outcomes of an action. Often a chosen behavior does not end in the intended result, and in this model, the chosen action is the important feature of behavior, without considering if the action produces beneficial or detrimental outcomes.

Bandura (1997) discussed three forms of the environmental component of this model: those imposed, selected and created. The first type, imposed, represents "...the physical and sociostructural environments that are impinges on people whether they like it or not. They do not have much control over its presence, but they do have leeway in how they construe it and react to it" (Bandura, 1997, p. 163). The idea of a selected environment is based on the difference between a potential environment and the actual environment. People choose their actual environment based on their behavior and can select rewarding aspects of an environmental condition or its punishing aspects. The final type, created environments, is not a choice in the potential environment that can be selected. Instead, people can create social environments that allow them greater control of

their lives, especially if they have personal beliefs in their capabilities to create the change.

The personal factors in this model are internal cognitive, affective, and biological events (Bandura, 1997). Human cognition is "...generative, creative, and proactive, not just reactive" (Bandura, 1997, pp. 4-5) and allows us to create novel thoughts. Cognition provides a mediating role in human behavior and allows people to think, feel, motivate themselves and perform. These cognitive processes allow us to consider and act upon our environment, and use self-perception, self-reflection and self-regulation to influence ourselves. In the past, personality theories have categorized the mind dually. In this dualistic view, people are called agents when they are acting on the environment and are called objects when they reflecting and acting on themselves. Social cognitive theory does away with this dichotomy, viewing the individual as being the same person shifting perspective in each of these acts and being both agent and object simultaneously. While social cognitive theory encompasses a variety of dimensions, two particular types of cognitive expectations are hypothesized to guided behavior: self-efficacy beliefs and outcome expectancies, which will be discussed in greater detail.

Self-efficacy theory.

As social cognitive theory has evolved, the construct of self-efficacy has become increasingly important as a central mechanism of human agency (Bandura, 1997; Murdock & Neafsey, 1995), and is an integral part of social cognitive theory. Self-efficacy is belief in one's capability to organize and execute a particular action under a given set of conditions. Bandura (1997) stated, "efficacy beliefs operate as a key factor in a generative system of human competence" (p. 37). Self-efficacy judgments influence

choice of activities, level of effort exerted, persistence in difficult situations, and performance. Self-efficacy beliefs serve as a mediator between capability and performance, so that a person's performance is partially governed by their belief that they can perform the action. This means that people with similar abilities, or the same person under different conditions, may perform differently depending on their self-efficacy beliefs. This focus on individual beliefs does not suggest that belief of capability is divorced from actual skills. Effective performance requires both the requisite skills and the belief that the skills can be successfully used in a given situation. "Without skill, performance isn't possible; without self-efficacy, performance may not be attempted" (Ertmer, Evenbeck, Cennamo, & Lehman, 1994, p. 46). Bandura (1982) stated that self-efficacy beliefs result in four types of behavior: (a) performance, (b) efforts towards emotional arousal, (c) coping efforts, and (d) persistence in challenging situations. Research has shown that precise and specific measurements of self-efficacy results in a highly correlation between self-efficacy beliefs and subsequent performance (Bandura, 1997).

Self-efficacy beliefs vary along several important dimensions including level of self-efficacy, generality of self-efficacy beliefs, and strength of efficacy belief (Bandura, 1997). The level of self-efficacy refers to the degree of challenge required in the given situation in which the person will perform. For example, if a person is to demonstrate his skill in driving a car, there would be low level of challenge if asked to perform the skill in a closed driving course, and self-efficacy might be high. If the level of challenge is to drive a car on a busy four-lane highway, the level of self-efficacy may be reduced.

Moreover, if the level of challenge is to drive competitively in a Grand Prix, the person's self-efficacy beliefs may be further reduced due to the high demands of the situation.

The generality of self-efficacy beliefs can also vary. In some performances, people may believe in their capability across a wide range of activities or only in certain domains of functioning. For example, a person's belief in their ability to perform well while playing games with peers may be broad across sports categories such as football and baseball, yet not extend to playing abstract strategy board games such as chess. Generality can vary along several dimensions: similarity of activities; whether the performance is expressed in the behavioral, cognitive, or affective realm; qualitative situational features; and the personal characteristics of the people involved in the action (Bandura, 1997).

Additionally, self-efficacy beliefs can vary by strength, which can affect motivation and perseverance (Bandura, 1997). If a person holds a weak belief in their ability to complete an action, they are more easily dissuaded than the person who holds a secure belief in their abilities, and may not even attempt the performance. Likewise, the person who has a strong self-efficacy belief will persevere longer and thus increase the chance that the action is successfully completed.

Self-efficacy beliefs are derived from four principle sources of information: (a) enactive mastery experiences, (b) vicarious experiences, (c) verbal persuasions, and (d) physiological and affective states. The information gathered by these methods requires cognitive processing and self-reflection before integration into a person's self-efficacy beliefs. The cognitive processing of this information is influenced by two characteristics according to Bandura (1997). First, the type of information attended to as indicators of

personal efficacy varies based on the four sources of self-efficacy information. For example, direct experience (mastery experiences) may require different or less cognitive processing compared to gleaning data on self-efficacy when the information comes from others' belief in your abilities (verbal persuasion). The second characteristic concerns the rules people use to evaluate the information when building their self-efficacy beliefs. For example, you might discount a friend's declaration of their belief in your ability to complete a task if you feel that they do not know how to complete the task themselves. The four principal sources of information regarding self-efficacy will be discussed in greater detail.

Enactive mastery experiences are the most influential source of information on self-efficacy since mastery experiences provide direct experience of whether a person can complete the necessary tasks or not (Bandura, 1997). Mastery experiences are performances where the person believes the outcomes were successful and the direct result of their actions. Successes in practicing a skill tend to build self-efficacy and failures tend to discourage self-efficacy beliefs. However, failures can be beneficial by allowing the person to build resiliency and demonstrating the need for sustained effort, which can result in more stable self-efficacy beliefs over time. Mastery experiences do not simply result in self-efficacy beliefs since the individual must self-reflect and weigh the pattern of successes and failures, the perceived difficulty of the task, the amount of effort the task required, and a host of other variables to arrive at a perceived self-efficacy for the task. This supports the idea that past performances do not necessarily best predict future performances. As people perform actions, and reflect on those actions, they make inferences resulting in self-efficacy beliefs, which is a better overall predictor of future

performance. Bandura (1997) claimed that enactive mastery experiences result in "...stronger and more generalized efficacy beliefs than do modes of influence relying solely on vicarious experiences, cognitive simulations, or verbal instruction" (p. 80). Research has shown that if past performance included repeated positive successful outcomes, that were viewed as the results of the person's own efforts, people are more likely to have strong perceptions of self-efficacy for that behavior (Ertmer, Evenbeck, Cennamo, & Lehman, 1994).

Vicarious experiences are the second source of information for self-efficacy beliefs. Much of human learning is the result of watching others attempt behaviors, retaining memory of the steps necessary for success, and later modeling the behavior (Bandura, 1997; Zemke, 1982). Vicarious experience can also allow us to rate our abilities in ambiguous situations by comparing ourselves with other's abilities. While it is sometimes evident that an activity was successful, there are no absolute indications of adequacy for many activities and we often look to others to provide a relative measure of our ability. If we believe we have abilities similar to a person viewed completing an action, we infer our ability to perform as well resulting in higher self-efficacy belief in our performance. Similarly, if we feel affinity to a person observed failing in a task performance, it is likely to diminish our belief in our ability to execute the task correctly. This source of self-efficacy beliefs is demonstrated in the assertion, "If they can do it, I can do it".

Verbal or social persuasion is the third source of efficacy information. Hearing that others believe in a person's ability to complete a task tends to assist the individual in believing that they have the ability to succeed. Verbal persuasion tends to help a person

boost their self-efficacy and persevere in the task after they would have given up without verbal support. For verbal persuasion to effect efficacy, the person must believe that the persuader is knowledgeable of the requirements of the task and credible in their judgments of the person's ability to complete the task. Verbal persuasion must be used appropriately however. Bandura (1977) stated, "to raise by persuasion expectations of personal competence without arranging conditions to facilitate effective performance will most likely lead to failures that discredit the persuaders and further undermine the recipients perceived self-efficacy" (p. 198).

In the last source of influence on self-efficacy beliefs, people use their physiological and affective states to inform them of their capabilities. Emotional arousal, stress, fear, tenseness, and feelings of elation, satisfaction, and irritation can all impact performance. People are likely to believe in their efficacy if they do not experience stress reactions when executing a behavior, since high levels of aversive arousal can negatively effect performance (Bandura, 1997). This type of influence varies by individual since some people quickly note somatic sensations while others are slow to attend to these feelings. By attending to salient somatic and emotional states, self-efficacy beliefs can be improved by attempts to decrease stress level and negative emotions learning and performance.

Self-efficacy differs from other conceptions of personal efficacy according to Bandura (1997). Self-concept is a related construct that is defined as "...a collection of beliefs about oneself, arranged in some sort of hierarchical structure, and having direct influence on one's behavior" (Gorrell, 1990, p. 73). This self-belief is based on self-reflection, experience, and input from significant others (Rogers, 1959). Bandura (1997)

claimed self-concept is related to self-efficacy in that they both reflect belief in personal efficacy. However, Bandura felt the self-concept construct was too broad and lacked the high predictive ability of behavior as self-efficacy, especially when looking at a particular behavior under different conditions. Additionally, Bandura (1997) reported that if self-efficacy is controlled through research methods, self-concept loses its predictive ability.

Self-efficacy also differs from the concept of self-esteem. While the two concepts may be related, they are essentially different phenomena. "Perceived self-efficacy is concerned with judgements of personal capability, whereas self-esteem is concerned with judgement of self-worth" (Bandura, 1997, p. 11). Brockner (1988) described self-esteem as the relative level of an individual's characteristic self-evaluation at both general and specific levels. It is easy to think of situations where beliefs of self-efficacy and self-esteem are not interchangeable. For example, a person may have no belief in their ability to wrestle crocodiles, but neither do they experience extreme feelings of guilt and worthlessness. Self-efficacy and self-esteem are related however, since people often choose to do activities that give self-worth and they develop personal efficacy in those activities. Bandura (1997) summarized the situation by stating that while self-esteem is important, people need to believe in the capabilities to perform well.

Perceived self-efficacy is also different from locus of control. Locus of control (Rotter, 1966) refers to beliefs that personal actions will result in certain outcomes, whereas self-efficacy refers to the beliefs about capability to produce certain actions (Bandura, 1997). The locus of control concept is more similar to Bandura's outcome expectancies concept, which will be the preferred concept used in this discussion of beliefs about outcomes. Related to locus of control are other dispositional measures such

as perceived control or optimism. These constructs suffer the same fate when compared to self-efficacy. Bandura (1997) cites research supporting that these measures "...derive their predictiveness from their redundancy with efficacy beliefs" (p. 41).

Outcome expectancy.

Bandura (1997) defined outcome expectancy as a judgment of the likely consequence that will result from a particular action. In this definition outcomes are differentiated from performance and performance markers. For example, receiving a grade of "A" in a college course is a performance marker, not an outcome. By definition, outcome expectancies are the consequences that the person believes will follow a course of action in a specific situation, not the performance itself. In the college course example, the student may envision academic progress, peer and professorial praise, or self-satisfaction as the expected outcome of an "A" performance.

Three major types of outcome expectancies are physical effects, social effects, and self-evaluative reactions (Bandura, 1997). These types of outcome expectancies function as incentives to behavior when positive and disincentives to behavior when negative. Physical outcome expectations are sensory and physical experiences that accompany behavior and are pleasant and positive, or they can be aversive and painful. Positive or negative social outcome expectations are the second major type of outcome expectation and include the social reactions of others to the behavior. Social recognition, conferral of social status, monetary rewards, disapproval, rejection and imposed punishments are all possible examples of social expectations. The third type of outcome expectancy is self-evaluative reactions. If a person believes an outcome of an action will be at odds with their personal standards they will refrain from the action.

Expected outcomes are based on the personal judgment of capability to perform an action in a given situation (self-efficacy) and therefore offer little additional explanation of behavior when self-efficacy beliefs are controlled (Bandura, 1986). However, this does not mean that outcome expectancies are useless and do not impact behavior. Social cognitive theory suggests that the relationship between outcome expectancy and self-efficacy can influence behavior, especially when positive self-efficacy beliefs are present. It is also possible to divorce outcome beliefs from self-efficacy beliefs. For example, a student can consider their belief in his/her scholarly abilities without having to consider the outcomes of those abilities.

A combination of self-efficacy beliefs and outcome expectancy beliefs can provide a predictive view of human behavior and affective states. A variety of behaviors, attitudes, and affective states can result from a combination of positive and negative self-efficacy beliefs and positive and negative outcome expectancy beliefs. For example, if a person has both positive self-efficacy beliefs and positive outcome expectations for a particular course of action, they are likely to derive satisfaction from their accomplishments. In the case where self-efficacy beliefs are negative but the outcome expectancy is high, the person would see the benefits of a particular course of action, but feel they were unable to successfully undertake and complete the action. This would result in personal devaluation and feelings of ineptitude since they would believe that other people could attain benefits of their successful efforts but that they lack the capability to do the same. The third scenario is when a person has both low self-efficacy beliefs and low outcome expectancy. In this situation the person would feel like they lack the ability to organize and execute a particular action and would feel that no level of

effort by them or anyone else would result in valuable outcomes. This combination can promote feelings of apathy and powerlessness. The last situation is one where the individual believes in their ability to undertake a course of action but feels that the outcome expectancy is low and that no positive outcomes are obtainable. Here, the actions of the person with high self-efficacy for a particular action would continue their efforts long after the person with low self-efficacy would have quit. Having a high self-efficacy and low response in outcome can result in protest, resentment, or could result in collaborative efforts to change the existing unresponsive system (Bandura, 1997).

While Bandura (1997) described self-efficacy and outcome expectations to be distinct and to have different roles in predicting behavior, others have argued that the relationship between the two variables is more complex and does not represent a linear relationship (Eastman & Marzillier, 1984; Kazdin, 1978; Teasdale, 1978). These authors felt self-efficacy beliefs are somewhat dependent on outcome beliefs, instead of outcome beliefs being determined from self-efficacy beliefs as described by Bandura.

An example illustrating the relationship between outcome expectations and self-efficacy is presented by Eastman and Marzillier (1984), who describe a socially inept man who is invited to attend a party. The man envisions making a fool of himself, being unable to talk to anyone, and believes others will ridicule him. Eastman and Marzillier (1984) claimed the man may decide not to attend based on his belief of the outcomes, and that the man infers his efficacy from his imagined outcomes. Bandura (1984) countered that people do not envision outcomes without thinking of a particular task and their performance of the task. Therefore, it is unlikely the man decides not to attend the party because he envisions poor outcomes and decides he must have little confidence in his

ability to socialize at the party. Instead, he probably reasons the causation of his poor performance to be based on his inadequate skills.

Distance Education

Distance education can be described as educational practice where the instructor and learner are separated by physical distance, the learners are adults, and the courses offered originate from a central location are received by students through some means of delivery (Shomaker, 1998). This definition represents the common definition for distance education, however other definitions have been offered in the literature. While there are several viable definitions for the generic term of distance education, some authors have felt additional discrimination is needed between the many different manners in which distance education is accomplished. One such discrimination involves distinguishing distance education by its form.

Barker, Frisbie, and Patrick (1989) suggested that the form of courses could be differentiated as correspondence-based or telecommunications-based distance education. In this dichotomy, correspondence-based distance education transmits materials in some manner to the learners, who complete assignments independently and return to the instructor. Telecommunications-based distance education uses live audio or video technology to provide delivery of materials and interactions between the instructor and students. Telecommunications-based distance education has several features: it bridges geographical distance, allows live interaction and immediate feedback, provides a structure for interaction between learners, and allows for greater educational access (Barker et al., 1989).

Palloff and Pratt (1999) agreed that courses and degree programs offered over the Internet are a particular type of distance education, which they termed computer-mediated distance education. They described computer-mediated distance education having several elements including: separation of learner and instructor by space and time for most of the instructional experience; use of educational media to facilitate communication between instructor and learner, as well as to deliver course content; allowance for two-way communication between instructor and learner; and permits the learner to regulate the learning experience rather than the instructor. Furthermore, they described the key feature of computer-mediated distance education as being the creation of an online learning community. "Key to the learning process are the interactions among students themselves, the interactions between faculty and students, and the collaboration in learning that results from these interactions" (Palloff & Pratt, 1999, p. 5).

While online instruction is a relatively recent innovation, distance education has been in practice for a much longer period. Correspondence-based, "study from home" programs began in the late 1800's (Shomaker, 1998; Verduin & Thomas, 1991). In the 1940's and later television began playing a larger role in distance education and was instrumental in providing a university education for student populations benefiting from the G.I. Bill of Rights. In later decades, as enrollment decreased for universities, television provided another service by attracting non-traditional students to higher educational opportunities.

Distance education has changed as technological achievements have increased our ability to transmit information. The delivery method of distance education may include audio and videotapes, television, satellite transmission, fiber optics, telephones,

computers, e-mail, as well as use the Internet and computer-mediated conferencing (Shomaker, 1998).

The Theory and Research Literature Specific to Topic

The theory on online instruction and self-efficacy beliefs is still developing, but self-efficacy related to computer skills and instruction has been investigated frequently in the past 15 years. This discussion of related literature and theory specific to the development of a online instruction self-efficacy instrument will include: (a) the current theory and research of online instruction, (b) an evaluation of current measures of self-efficacy for computer skills, and (c) past and current research of computer self-efficacy.

Online Instruction Theory

The components of online instruction have been organized in several different ways. Berge (1997) described several advantages of computer-mediated conferencing (CMC) that can be applicable to online instruction. The asynchronous aspects of a course allow learners to access materials and resources at any time. Additionally, it allows time for learners to reflect on their own responses and the responses of their peers, which can result in deeper, more critical thinking. This type of conferencing may also encourage interdisciplinary, complex problem solving instead of working on linear, simplistic projects and assignments. CMC may also change the roles and characteristics of learners and instructors and may allow for greater use of mentoring and apprenticeship models (Berge, 1997).

Online instruction characteristics.

Harasim (1990) identified five important characteristics of online instruction:

1. Many-to-Many Communication: Group interaction and information exchange in a many-to-many format is possible using computer conferencing.

2. Place-Independent Group Interaction: Group activities and collaborative efforts are available to geographically dispersed groups.

3. Time-Independent Communication -- Asynchronous: Learners can communicate at any time and place convenient to them.

4. Text-based communication: While some video and audio communication does occur with online instruction, most information transfer is text-based.

5. Computer-Mediated Learning: Learning and communication processes are mediated by computers.

Online instruction can be described in terms of components and features, (Khan 1997). Components are defined as integral parts of the online instruction system, which alone or in combination with other components, contribute to the features of online instruction. Table 1 shows the components of online instruction compiled by Khan. These components and features will be used as guides to the essential elements of online instructional activities that will be assessed in the survey instrument.

The features of online instruction were into two categories: key features and additional features. Key features of online instruction include: "interactive, multimedial, online search, device-distance-time independent, globally accessible, electronic publishing, uniformity world-wide, online resources, distributed, cross-cultural interaction, multiple expertise, industry supported, learner-controlled, etc." (Khan, 1997, p. 8).

The additional features, which are dependent on the quality and advancement of the online instruction system, included: "convenient, self-contained, ease of use, online support, authentic, course security, environmentally friendly, non-discriminatory, cost

Table 1
Components of Online Instruction

Online Instruction Component Cluster	Individual Components
Content Development	Learning and instructional theories, Instructional design, Curriculum development
Multimedia	Text and graphics, Audio streaming, Video streaming, Graphic user interface, Compression technology
Internet Tools	Communication tools (asynchronous and synchronous), Remote access tools, Internet navigation tools, Search engines
Computers and Storage Devices	Computers and different computer platforms, Servers, hard drives, CD-ROMs, etc.
Connections and Service Providers	Modems, Dial-in and dedicated services, Internet service providers
Authoring Programs	Web programming languages, Authoring tools, HTML converters and editors
Servers	HTTP servers, etc., Common Gateway Interface (CGI)
Browsers and Other Applications	Text-based browsers, graphical browsers, etc., Links, Additional web browser applications (plug-ins)

Note. Adapted from "Web-based instruction (WBI): What is it and why is it?" by B. H. Khan, 1997, In B. H. Khan (Ed.), Web-based instruction (pp. 6-7). Englewood Cliffs, NJ: Educational Technology Publications.

effective, ease of coursework development and maintenance, collaborative learning, formal and informal environments, online evaluation, virtual communities, etc." (Khan, 1997, p. 8). These features and additional features are inherent to online instruction and impact learning and instruction on the web. The capability to use these combined features and components of online instruction are part of what online instruction self-efficacy beliefs are referring to.

Research on online instruction.

Jiang (1998) examined 19 online courses using both qualitative and quantitative methods to determine how students perceived their learning experience and what

instructional factors were perceived to influence learning. The researcher used survey responses, participant observation, and demographic information from 109 students. Major findings indicated:

1. Sociocollaborative emphasis in online instruction courses were more conducive to perceived learning. Students reported perceived higher learning in the courses that emphasized online discussion.

2. Courses that provided a balance of beyond the information given (BIG) and without the information given (WIG) were perceived as more conducive to learning.

3. A possible relationship existed between the level of instructors' questions and the learner's responses. When questions required higher cognitive skills and reflection on personal experience the learner's answers were more in-depth, went beyond the basic information, and seemed to use critical thinking skills.

Relationships among attitudes, motivation, and learning styles of students enrolled in online courses were investigated by Shih (1998). The researcher used 99 students enrolled in two undergraduate courses as subjects and used the Group Embedded Figures Test (GEFT) as a measure of learning style. A researcher-designed survey instrument also examined student motivation, learning strategies, feelings towards online instruction, learning patterns, and demographic variables using a five-point Likert scale. Findings indicated that both females and males were field-independent learners, although males scored higher on the GEFT. Students' attitude towards online instruction was between "undecided" and "agree" ($\bar{x} = 3.49$) and student's responses to positive statements of motivation to participate in online instruction were between "somewhat typical of me" and "quite typical of me" ($\bar{x} = 3.48$). The researcher also found no significant difference between students classified as field-dependent learners and those who were field-independent learners in relation to their performance. In linear

hierarchical regression analyses, the only significant variables for performance were motivation and learning strategies. Learning styles, attitudes towards online instruction, and student demographic variables were insignificant. The researcher called for research to investigate self-regulated learning related to online instruction as a possible means to improve performance.

Reinhart (1999) investigated the relationship between motivation to use online instruction, self-efficacy beliefs and task difficulty. This study used 63 undergraduate education majors who were grouped by their perceptions of self-efficacy with online instruction as either low, medium, or high. The subjects were then randomly assigned an instructional task using the World Wide Web of either low, medium or high task difficulty. Additionally, the researcher measured the learners' beliefs regarding their control of learning and their perceived value of online instruction. Findings indicated:

1. A significant positive relationship existed between students' self-efficacy for online instruction and motivation to learn from online instruction.

2. No effect between task difficulty and motivation to learn from online instruction was found.

3. A significant relationship between motivation to learn from online instruction and self-efficacy beliefs for learning from online instruction was reported. In ANOVA analysis, self-efficacy explained 17.46% of the variance found in the motivation measurement.

4. Findings suggested that the issue of the learners' control during learning may not be important for some online instructional activities. Reinhart found no significant correlation between learners' beliefs that their efforts to learn will result in positive performance (control for learning) and motivation to learn from online instruction, nor was motivation significantly correlated with achievement. However, a significant correlation between self-efficacy and control of learning was found ($r = .543, p < 0.01$).

Other studies have examined the qualitative aspects of the online instruction experience. Hara and Kling (2000) presented a qualitative case study of an online course offered in 1997. The study focused on the periodic distressing experiences of students while taking the course and the researchers used observation, interviews and document review qualitative methodologies to gather data. Hara and Kling detailed learners' distress in several categories: (a) technological problems of attending a virtual synchronous chat session, (b) the volume of email generated for students to read and respond to, (c) complexities of working alone, (d) other general internet-related technical problems, and (e) ambiguous instructions in emails. The researchers felt that the students' distress focused around two categories: technological problems / lack of technical support, and problems with course content and the instructor's management of communications with the students. The article concluded that too often only the positive aspects of online instruction are discussed, leaving the negative elements ignored and that research into online instruction should examine both the positive and negative elements of the instructional technology.

The cognitive strategies of learners have also been investigated. Hill and Hannafin (1996) examined the use of cognitive strategies by learners involved in searching the World Wide Web for information as part of a traditional format class. The researchers used qualitative and quantitative procedures to explore the strategies used by participants and measured five self-reported areas including disorientation during searching, perceived self-efficacy, metacognitive knowledge, system knowledge, and subject knowledge. The study resulted in several findings: (a) metacognitive skills, skills related to awareness of cognition such as self-reflection, most influenced search strategies used

compared to other knowledge areas, (b) disorientation influenced strategies employed and was a severely disabling influence on performance, and (c) self-efficacy influenced the number and type of strategies used. Those participants with higher perceived self-efficacy engaged in more strategies and higher order strategies than participants with lower self-efficacy.

Computer Self-Efficacy Instruments

The computer self-efficacy literature reports several instruments have been designed to measure self-efficacy related to computers and learning. While these instruments do not examine online instruction self-efficacy specifically, they do overlap in areas related to learning new computer technology, use of computer technology, use of the self-efficacy concept, and attitudes toward computer technology. A summary of the researchers and instruments discussed in this chapter are presented in Table 2.

The computer self-efficacy measure.

Compeau and Higgins (1995) described research in developing and testing a measure of computer self-efficacy based on Bandura's social cognitive theory. In their research computer self-efficacy was defined as "...an individual's perception of his or her ability to use a computer in the accomplishment of a job task..." (Compeau & Higgins, p. 193). A ten-item survey was designed to address computer use in general, but the researchers did attempt to assess task difficulty with the instrument.

In developing a research model of computer self-efficacy, the researchers identified several key constructs to be considered, along with self-efficacy, to influence perceptions of computer use. The constructs assessed in this study in addition to self-efficacy, included: encouragement by others, other's use, support, affect, anxiety, and

Table 2
Relevant Existing Self-Efficacy Instruments Discussed in the Literature Review

Source	Instrument Title
Compeau & Higgins, 1995	Computer Self-Efficacy Measure
Compeau, Higgins, & Huff, 1999	
Murphy, Coover, & Owen, 1988	Computer Self-Efficacy Scale
Murphy, Coover, & Owen, 1989	
Moroz & Nash, 1997	
Torkzadeh & Koufteros, 1994	
Qutami & Abu-Jaber, 1997	
Carlson & Grabowski, 1992	
Harrison & Rainer, 1992	
Karsten & Roth, 1998	
Loyd & Gressard, 1984	Computer Attitude Scale
Kinzie, Delcourt, & Powers, 1993	Attitudes Toward Computer Technologies
Kinzie & Delcourt, 1991	Self-Efficacy For Computer Technologies
Ertmer, Evenbeck, Cennamo, & Lehman, 1994	
Decker, 1996	
Buhendwa, 1996	Computer Confidence/Self-Efficacy Scale
Smith, 1994	Task-Specific Self-Efficacy Beliefs
	Generalized Self-Efficacy Beliefs
Zhang & Espinoza, 1997	Computer Technologies Survey
Tam, 1996	Self-Concept Questionnaire for the Physically Disabled Hong Kong Chinese
Ramalingam & Wiedenbeck, 1998	Computer Programming Self-Efficacy Scale

usage. Independent surveys were developed or located for the six other elements. The research subjects for this study were 1,020 knowledge workers that included line staff as well as management in the areas of accounting and finance. The research subjects for this study were 1,020 knowledge workers that included line staff as well as management in the areas of accounting and finance, general management, and marketing. A partial least squares (PLS) regression-based statistical technique, similar to principal component analysis, was used to analyze the model.

Findings indicated that the self-efficacy scale had high internal reliability (.95), demonstrated discriminant validity, and was a good predictor of computer use (total effect = 0.423) (Compeau & Higgins, 1995). The study found that subjects that had high computer self-efficacy used the computer more, had less computer-related anxiety, and experienced more enjoyment from using the computer. Interestingly, it was found that the availability of support had a negative relationship with self-efficacy. The researchers offered two possible explanations of this. It is possible that those people who knew of the supports available and used those supports had lower self-efficacy, related to being computer novices. Alternatively, it may be that availability of help may actually hinder building self-efficacy beliefs, since the learner always has someone to fall back on when experiencing difficulty, preventing them from enhancing their self-reliance and personal mastery.

The computer self-efficacy measure has also been tested longitudinally (Compeau, Higgins, & Huff, 1999). The researchers used the same subject group from their 1995 study and resurveyed them a year later, resulting in 394 matching responses used for the longitudinal comparison. The survey instruments used in each time were

nearly identical, with slight modifications by removal of items found to be insignificant in the 1995 study.

The resulting partial least squares (PLS) analysis found results similar to the 1995 study showing self-efficacy to be predictive of computer-related affect, anxiety, and computer use. It was reported that self-efficacy explained 18% of the variance seen in an individual's computer usage. The study also noted a small negative relationship between personal outcome expectations and computer usage. The researchers speculated that person's having unrealistic expectations might be less satisfied with computer use and therefore decrease their use. The researchers concluded the following: (a) that low self-efficacy can extend over a long period of time and might have a downward spiraling relationship, (b) if successful computer use requires users have high self-efficacy beliefs in their ability to use technology, then methods to improve self-efficacy should be used (i.e., computer training), and (c) this research contradicts the possible idea that low computer self-efficacy would disappear as the use of technology in our society continues to increase. Over a year period of time, the researchers found that self-efficacy still predicted use, even with steady increase in experience with technology that continues in our society (Compeau et al., 1999).

The computer self-efficacy scale.

Murphy, Coover, and Owen (1988, 1989) developed the computer self-efficacy scale (SCE) and tested the new instrument with 414 persons learning to use computers in three different settings including graduate students, adult vocational students, and nurses. The researchers generated 42 items from the current literature and analysis of three courses in microcomputer and mainframe computer use. A panel of five experts who

taught computer courses examined the instrument for face validity and trimmed the CSE into a 32-item survey. The instrument used a 5-point Likert response format. Principal component analysis with oblique rotation resulted in three-factors that explained 92% of the variance found in the instrument. The three factors found were labeled beginning level computer skills, advanced level computer skills, and mainframe computer skills. The reliability coefficients were .97, .96, and .92 for each respective factor.

Many researchers have used the CSE scale to study self-efficacy beliefs and their relationship to learning, as detailed in a previous section. The CSE has already been widely used to investigate computer self-efficacy beliefs in many different populations: graduate students, adult vocational workers, and nurses (Murphy, Coover, & Owen, 1989), graduate students in education (Moroz & Nash, 1997), business undergraduates (Torkzadeh & Koufteros, 1994), international undergraduate students (in a modified form) (Qutami & Abu-Jaber, 1997), international persons with disabilities (in a modified form) (Tam, 1996), and education students and students in ROTC training (Carlson & Grabowski, 1992).

Other researchers have examined the CSE to establish its validity and reliability. Harrison and Rainer (1992a) used the CSE developed by Murphy, Coover, and Owen (1988, 1989) to examine the factor structure and concurrent validity of the computer self-efficacy scale, a computer attitude scale (Nickell & Pinto, 1986) and a computer anxiety rating scale (Heinssen, Glass, & Knight, 1987). The study data was collected from 776 university personnel and was analyzed with principal component factor analysis with orthogonal rotation. The researchers found that the CSE factors for beginning computer skills and advanced computer skills were more related to each other than either of these

factors was to the mainframe skills factor. Instead of three separate factors, they suggested that the main difference was between microcomputer skills and mainframe skills. Additionally, Harrison and Rainer reported moderate correlation of the CSE to the Computer Attitude Scale and the Computer Anxiety Rating Scale.

The CSE has been also been revised by other researchers. Moroz and Nash (1997) re-examined the computer self-efficacy scale (CSE) developed by Murphy, Coover, and Owen (1989) to improve the factorial structuring of the instrument and to explore the concurrent and discriminant validity of the CSE. Moroz and Nash chose to compare the computer self-efficacy construct with the construct of computer anxiety since it is negatively correlated with perceived computer skills (Harrison & Ranier, 1992b) and it is related to computer experience (Ertmer, Evenbeck, Cennamo, & Lehman, 1994). Loyd and Gressard's Computer Attitude Scale (1984) was used for this concurrent and discriminant analysis since it had subscales for computer confidence and computer anxiety. The subjects for the study were 216 students enrolled in graduate level education courses at a southwestern university. The subjects completed both the CSE and the two CAS subscales. Principal component factor analysis of the CSE with Varimax rotation produced four factors that accounted for 69.6% of the variation. Moroz and Nash found that the four factors basically corresponded to the factor structure reported by Torkzadeh and Koufteros (1994). The analysis of the convergent and discriminant validity of the CSE was supported by the research, finding that the four CSE subscales were negatively correlated with the CAS computer anxiety subscale. Additionally, the CSE was significantly positively correlated with the CAS computer confidence subscale.

The self-efficacy for computer technologies scale.

Kinzie, Delcourt, and Powers (1993, 1994; Kinzie & Delcourt, 1991) tested two measures of computer technologies, the Attitudes Toward Computer Technologies (ACT) and the Self-Efficacy For Computer Technologies (SCT) scales, with 359 undergraduate students across three disciplines. Students in business, education, and nursing disciplines participated in this single-measurement study focused on the predictive ability of attitudes towards self-efficacy beliefs after eliminating the effects of demographic variables and experience. The ACT and SCT scales were analyzed by principal component analysis with Varimax rotation. The ACT resulted in an 8-item factor reflecting comfort/anxiety related to computer technologies and two factors intermixed in the hypothesized "usefulness" of computer technologies factor. Since these two factors were moderately correlated (r = .46), the researchers retained a single usefulness factor. The reliability coefficients for the two scales of the ACT were .85 (usefulness) and .91 (comfort/anxiety). The SCT resulted in a six-factor solution: spreadsheets, database programs, e-mail, word-processing, statistical packages, and CD-ROM databases. The reliability coefficients for the SCT factors were .98, .99, .98, .95, .97, and .98 respectively. The researchers employed a hierarchical regression procedure for each computer technology to remove variance from the demographic variables and prior experience before entering that particular factor into the regression model. Results indicated that attitudes towards computer technology contributed significantly to the prediction of self-efficacy beliefs for each computer technology even after demographic variables and experience were accounted for.

Other researchers have also used the self-efficacy for computer technologies (SCT) scale. Ertmer, Evenbeck, Cennamo, and Lehman (1994) used a form of the SCT, the computer technologies survey (CTS), form B, (Kinzie & Delcourt, 1991) with undergraduate students. The researchers investigated positive computer learning experiences and their effects on building computer self-efficacy, as discussed in the next section.

The ACT and SCT have also been used as a combined instrument. Buhendwa (1996) tested a new form of the ACT and SCT instruments using preservice teachers as subjects. In this study, the ACT and SCT instruments designed by Kinzie and Delcourt (1991) into a single instrument, the Computer Confidence/Self-Efficacy scale. The instrument was designed to have general self-efficacy for computer technologies component and a component to measure self-efficacy related to specific areas of computer use. While no specific data analysis was discussed, the researcher claimed that the instrument had high reliability. The researcher suggested that further investigation include analysis of confidence in using multimedia and other interactive systems on the computer.

Research on computer self-efficacy.

Gist, Schwoerer, and Rosen (1989) examined the effects of alternative training methods on self-efficacy and mastery of a computer software program using 108 university managers. The managers were trained to use a popular software package capable of financial and spreadsheet analysis in a three-hour training program consisting of six one-half hour training sessions. The researchers used two training methods: (a) behavioral modeling where a videotaped model demonstrating specific steps in using the

software and the subjects concurrently completed the demonstrated task, and (b) tutorial training where the subjects completed the same concepts and tasks but used a computer and a tutorial diskette. Subjects in both conditions received feedback from their computers on their effectiveness in completing each training task. Results indicated that the modeling training yielded 11% better performance in learning the training tasks when compared to the computer-aided instruction (CAI) tutorial. The subjects in the behavioral modeling group also gained greater self-efficacy in using the computer software and higher satisfaction in the training. It was also noted that subjects in the behavioral modeling group who had low levels of computer self-efficacy (assessed prior to training) ended with four times greater software self-efficacy when compared to subject with low computer self-efficacy in the tutorial training group. It seemed that those subjects with low computer self-efficacy experienced some debilitating effect from using the computer tutorials to learn the software program.

Self-efficacy has also been proposed as a means of increasing transfer of training (Carroll, 1993) in adult learning. Carroll suggested that using Bandura's four methods of enhancing self-efficacy, enactive mastery experiences, vicarious experiences, verbal persuasion, and physiological/affective states, as instructional methods could provide a theory-based schema for positive transfer of instruction. Such a learning program would includes practice, modeling, suggestion, and attend to physical and psychological needs of the learners. Carroll argued that theory-based program designs that include concepts of social cognitive theory and self-efficacy have a greater potential for transfer of training.

Another University of Tennessee graduate, Decker (1996, 1999), investigated transfer of training influences on computer self-efficacy after computer training, using

2597 university employees. The self-efficacy of computer technologies scale (SCT) (Kinzie & Delcourt, 1991) was administered after the subjects had received a computer-related training course over the previous period of 2.5 years. Results showed that previous classroom computer training, computer use required on the job, frequency of computer use, use of a computer at home, and the subjects training responsibilities all impacted computer technologies self-efficacy. Decker also reported that self-efficacy beliefs regarding computer technologies did not change based on time since training, at least for the 2.5-year period studied.

Smith (1994) researched task-specific self-efficacy beliefs (TSE) and generalized self-efficacy beliefs (GSE) regarding computers and technology tasks using university students. Additionally, Smith supplemented one of the group's learning with verbally persuasive lectures and then tested both groups, along with a control group, using a pre-and-post test design on TSE and GSE instruments. Findings suggested that both the standard instruction group and the verbal persuasion instruction group both gained TSE over the control group. Both groups also increased in GSE score, however the females made significant gains whereas the males did not. The use of convenience sampling, lack of validation of the TSE and GSE survey instruments, and use of only two verbal persuasion lectures limits this study. Additionally, Smith used a dichotomous scale on his instruments whereas Bandura (1997) suggested a 10-point scale to allow for necessary discrimination. Finally, by not placing the survey items in a graduated contextual base, as suggested by Bandura, both instruments probably sacrificed predictive power.

The relationship among computer experience computer self-efficacy and computer-dependent performance has also been investigated. Karsten and Roth (1998)

examined this relationship in a college introductory computer course. This research used the computer self-efficacy (CSE) measure designed by Murphy, Coover, and Owen (1989), which was administered to 98 college students beginning an introductory computer course and at the end of the course. Total years of computer experience, average computer use per week, and the number of prior computer courses were also assessed. These independent measurements were compared to the student's actual performance in the class (the dependent variable). Reported findings included: (a) computer experience, average weekly computer use, and prior computer courses were all correlated with computer self-efficacy, (b) computer self-efficacy increased between pre-course and post-course measurement (from $\bar{x}$= 118.73 to $\bar{x}$ = 153.60 out of 175 maximum points), and (c) only computer self-efficacy and average weekly computer use were significantly correlated to performance in the course. Additionally, in multiple regression analysis only the pre-course computer self-efficacy measure was significant in predicting performance, which is consistent with theoretical claims and previous research (Bandura, 1997).

Self-efficacy beliefs, along with motivational beliefs, have been assessed for computer instruction. Kellenberger (1996) examined perceived computer self-efficacy beliefs of preservice teachers after attending a general computer methodology course for one hour a week for 16 weeks. The researcher measured the subjects' motivational beliefs (achievement and value-related beliefs about computer experiences) and perceived self-efficacy in helping students use computers. Using MANOVA procedures, results indicated teachers' past successes with computer and the perceived value of computers to themselves and their careers were significant effects of self-efficacy. Additionally, the

value of computer skills to themselves and their careers was related to all the self-efficacy variables. Kellenburger concluded that teaching programs should attempt to increase successful computer experiences and should emphasize the value of computer skills for personal needs and career enhancement.

Other research has compared self-efficacy beliefs for computer skills with attitudes toward computers. Zhang and Espinoza (1997) investigated student attitudes towards computers, their self-efficacy beliefs in using computers, and the need for learning computer skills. Students in three computer classes and one non-computer class (n = 220) were surveyed. The researchers created an instrument, the Computer Technologies Survey (CTS), to measure the participants' need for learning computer skills and compared this with Delcourt and Kinzie's (1993) Attitudes toward Computer Technologies (ACT) scale and Murphy, Coover, and Owen's (1989) Confidence and Desired Knowledge with Computer Technologies (CDK) scale. Results included student's attitudes towards computers were significant predictors of student's perceived need for computer skills, and that students in the computer courses expressed more need to learn computer skills than the students in the non-computer class. Additionally, self-efficacy beliefs of beginning computer skills, advanced computer skills, and telecommuting had significant effects on the subjects' need for learning computer skills.

Carlson and Grabowski (1992) conducted research on direction-following behavior in computer-assisted instruction (CAI) and computer self-efficacy. Fifty-seven undergraduate students completed a CAI module that scored students direction-following behavior, as well as the Computer Self-Efficacy (CSE) scale created by Murphy, Coover, and Owen (1989). The study also examined the direction-following behavior of students

in ROTC training compared to other students. The results did suggest that those students in ROTC training followed directions more than other students. Of more interest, results suggested that males exhibit higher perceived self-efficacy, as seen in other studies (Muira, 1987; Murphy, Coover, & Owen, 1989; Jorden-Bloom, 1988), yet gender differences were seen in direction-following behavior. Females with low computer self-efficacy followed more directions than females with high self-efficacy, which might be expected. However, for males this relationship was reversed. Males with low computer self-efficacy followed fewer directions than males with higher computer self-efficacy.

Self-efficacy for computer performance has been tested with persons with disabilities. Tam (1996) examined the computer self-efficacy beliefs of people with physical disabilities in relation to computer performance and outcomes. Tam used a self-designed instrument, the Self-Concept Questionnaire for the Physically Disabled Hong Kong Chinese (SCQPD) to measure self-concept, computer self-efficacy, and computer skills performance. Additionally, a modification of the Computer Self-Efficacy (CSE) scale, created by Murphy, Coover, and Owen (1989), was used. In this study 31 participants with physical disabilities were trained in a basic computer operation programs, general Chinese computer skills, and a Chinese desktop publishing program over a 15-week period. Results showed that computer skills performance was best predicted by pretraining computer self-efficacy and pretraining computer skills level.

Other experimental designs have been used in self-efficacy research. Madorin and Iwasiw (1999) investigated the use of computerized simulation on self-efficacy for nursing students. Twenty-three second-year nursing students were used in a quasi-experimental design with the treatment group (n = 11) using a 30-minute computer

simulation, after which the researcher-developed nursing self-efficacy instrument was administered. The control group (n = 12) did not use the computer-assisted instruction, nor complete the self-efficacy instrument at that time. Both groups took the self-efficacy measure as a pretest and after eight weeks of instruction. The researchers found a significant increase in nursing self-efficacy after the computer simulation. While this research had several limitations, it demonstrates the effect of direct experience, facilitated by computers, on self-efficacy.

Research examining self-efficacy related to gender has also been conducted. Qutami and Abu-Jaber (1997) researched computer self-efficacy related to gender and cognitive learning style using 165 students enrolled in an introductory computer course. The researchers used a translated version of the Computer Self-Efficacy (CSE) scale, created by Murphy, Coover, and Owen (1989) that was modified after expert analysis. Additionally, a embedded figure test was administered to the students to measure cognitive learning style. Results showed no gender effect on overall computer self-efficacy but found that males tended to have greater self-efficacy with beginning computer skills. No gender differences were found with advanced computer skills. The researchers also found that learners with independent cognitive learning style, compared to learners with dependent learning style, had higher self-efficacy regarding advanced computer skills.

A repeated-measures experiment, designed by Ertmer, Evenbeck, Cennamo, and Lehman (1994) researched the effects of positive computer experiences in a non-threatening environment upon computer self-efficacy. Using a repeated-measures experimental design with control group, the researchers administered the Computer

Technologies Survey (CTS), Form B, (Kinzie & Delcourt, 1991) to 32 undergraduate students enrolled in a 16-week introductory computer applications course. The students not in the control group were assigned to either an e-mail or word-processing group. The experiment was designed to give the students in each group more time-on-task for their particular technology (e-mail or word-processing) and self-efficacy was measured pre-test, post-test, and delayed after the test. The only instructional difference between the three groups was additional communication with the instructor through their specific technology, i.e., e-mail for the e-mail group and word-processing for the word-processing group. The students in the control group received the same amount of time and feedback from the instructor but communications were handwritten reducing their amount of time-on-task compared to the experimental groups. Results indicated that significant change in computer self-efficacy did occur for all groups. However, the independent variable, time-on-task, with the specific technology, did not seem to influence the computer self-efficacy judgments of the students. It is possible that the positive learning environment with additional support from the instructor resulted in the increased self-confidence and the outside additional time-on-task added little to self-efficacy judgments. The researchers concluded that quality of experiences might be more important to self-efficacy than quantity of experiences.

Other researchers have used the CSE scale in a pre-test/post-test design. Torkzadeh and Koufteros (1994) investigated the influence of computer training on computer self-efficacy using a modified version of the computer self-efficacy scale (CSE) developed by Murphy, Coover, and Owen (1989). It should be noted that the CSE instrument was reduced to 30 items from the 32 items original to the instrument. This

study design used 224 students (125 males, 99 females) enrolled in a core computer course for business undergraduates as subjects. The data was analyzed by principal factor analysis yielding four-factor solution: beginning skills, mainframe skills, advanced skills, and file and software skills. Results indicated significant changes in pre-test and post-test computer self-efficacy for both males and females. In the pre-training scores, females scored significantly lower on the computer file and software management factor when compared to males, however in the post-training scores, no significant differences between females and males were found in any of the four factors.

Ramalingam and Wiedenbeck (1998) investigated the effects of instruction on the self-efficacy judgments of 421 students enrolled in a 12-week introductory C++ programming course. A pre-test/post-test design without control was used and the authors developed the 32-item survey instrument, the computer programming self-efficacy scale, with review by three self-efficacy experts and three C++ programming language teachers. Examination of the instrument revealed an overall alpha reliability of .98 and an exploratory factor analysis with oblimin rotation resulted in four factors: independence and persistence, complex programming skills, self-regulation, and simple programming tasks. The study indicated that the students significantly increased ($p < .05$) in C++ programming self-efficacy beliefs between the two administrations of the instrument on all four factors. Additionally, those students with the lowest self-esteem made the largest increase in self-efficacy, which is consistent with Bandura (1997) propositions. Small differences between females and males were found in the self-regulation subscale but the researchers felt this was of little practical significance due to small effect size, only accounting for 2% of the variance.

Factor analysis has also been applied to self-efficacy instruments. Kinzie, Delcourt, and Powers (1993, 1994; also see Kinzie & Delcourt, 1991) tested two measures of computer technologies, the Attitudes Toward Computer Technologies (ACT) and the Self-Efficacy For Computer Technologies (SCT) scales, with 359 undergraduate students across three disciplines. Students in business, education, and nursing disciplines participated in this single-measurement study focused on the predictive ability of attitudes towards self-efficacy beliefs after eliminating the effects of demographic variables and experience. The ACT and SCT scales were analyzed by principal component analysis with Varimax rotation. The ACT resulted in an 8-item factor reflecting comfort/anxiety related to computer technologies and two factors intermixed in the hypothesized "usefulness" of computer technologies factor. Since these two factors were moderately correlated ($r = .46$) the researchers retained a single usefulness factor. The reliability coefficients for the two scales of the ACT were .85 (usefulness) and .91 (comfort/anxiety). The SCT resulted in a six-factor solution: spreadsheets, database programs, e-mail, word-processing, statistical packages, and CD-ROM databases. The reliability coefficients for the SCT factors were .98, .99, .98, .95, .97, and .98 respectively. The researchers employed a hierarchical regression procedure for each computer technology to remove variance from the demographic variables and prior experience before entering that particular factor into the regression model. Results indicated that attitudes towards computer technology contributed significantly to the prediction of self-efficacy beliefs for each computer technology even after demographic variables and experience were accounted for.

Another instrument subjected to factor analysis was the Computer Self-efficacy Scale (SCE) created by Murphy, Coover, and Owen (1988, 1989). This instrument was tested with 414 persons learning to use computers in three different settings including graduate students, adult vocational students, and nurses. This one-measurement study examined the factorial structure of the instrument, discussed in another section, but also looked at computer self-efficacy judgements of the students. Murphy, Coover , and Owen found higher self-efficacy beliefs for males compared to females with the average male score at the 75 percentile of the female scores.

Research in Cognate Areas Relevant to the Topic

The role of the learner's cognitive and affective components has been identified as mediating factors integral to the learning experience. Additionally, self-reflection allows people to examine and alter their thinking and actions, and can influence self-efficacy (Bandura, 1997). In this section, metacognition and self-regulation, self-directedness in learning, and motivation will be examined in their relationship to online instruction and self-efficacy.

Metacognition and Self-Regulation

McInerney and McInerney (1998) used qualitative methods, in support of quantitative measurements, to examine the use of self-questioning as a metacognitive strategy in a computer training class. The examination of metacognition supplemented a quantitative study that compared teacher-led direct instruction with direction instruction subsidized with cooperative, self-regulated learning and the use of self-questioning. In an attempt to clarify the role of metacognition, the researchers also collected qualitative data after students in the intervention group had been trained in using a process of self-

questioning. The researchers made several comments regarding the use of metacognitive training:

1. Metacognitive training enhanced self-regulation and learning.
2. Reciprocal questioning among peers helped develop metacognitive skills.
3. Metacognitive training helped develop self-efficacy, self-regulated learning skills, and content knowledge.
4. Positive cognitions can develop through self-questioning even in the presence of anxiety.
5. Mutual assistance among peers helped relieve anxiety and build confidence.
6. The use of reciprocal peer questioning helped anxious students avoid embarrassment.

Collaborative Learning Related to Online Instruction and Self-Efficacy

Collaborative learning can certainly play a role in online instruction, based on the course requirements. McInerney and McInerney (1998), previously discussed in the section on metacognition, also examined the use of cooperative self-regulated group work as an instructional approach. This quantitative study compared direct instruction, led by an instructor acting as an expert trainer, with direction instruction subsidized with cooperative, self-regulated learning and the use of self-questioning, where the instructor's role was more as a facilitator. Additionally, qualitative data was collected regarding the use of cooperative group work and metacognitive skills. The researchers made several comments regarding the use of cooperative self-regulated group work:

1. Cooperative group work decreased anxiety, built confidence, and helped learning and motivation.
2. Self-efficacy can be enhanced through structured group work and metacognitive training in self-questioning.

3. Cooperative self-regulated group work can promote problem-solving skills and level of learner activity.

Other researchers have discussed the importance of collaboration in online instruction. Palloff and Pratt (1999) agreed that collaborative interactions among learners and between instructors and learners are key to the learning process, and discussed the potential usefulness of the online format to build communities of learners. Additionally, they felt that collaborative practices transfer well to the online instructional situation. Mabrito (2001) argued that collaborative interactivity between students and instructors was appropriate and possible in the online instruction environment.

Self-Directed Learning

Several definitions of self-directed learning have been given in the literature. Hatcher (1997) defined self-directed learning as a process in which the learner takes responsibility for their own learning, including examining their learning needs, developing objectives, designing their learning experiences, finding resources, and evaluating the learning outcomes. This definition is quite behavioristic in nature and focused on the learner's behaviors and actions. Other definitions have focused on the more social and cognitive aspects of the process. Garrison (1997) defined self-directed learning as "...an approach where learners are motivated to assume personal responsibility and collaborative control of the cognitive (self-monitoring) and contextual (self-management) processes in constructing and confirming meaningful and worthwhile learning outcomes" (p.18). Caffarella (1993) reported that three distinct ideas incorporate the concept of self-directed learning: a self-initiated process of learning that focuses on the individual's ability to plan and manage their own learning, characteristics of the

learner including autonomy in the learning process, and changes in formal learning settings that allows for greater learner control.

The literature related to self-directed learning has often focused in the past on the external management of the learning process (Garrison, 1997). These concerns focus on who has the locus of control in the learning experience and is based on the idea that people may become more involved in the their learning if they are able to make decisions relating to the learning process. This includes what will be learned, how it will be learned, and how it will be determined if/when learning has occurred. Other recent literature has begun to examine additional aspects of the self-directed learning process including the examination of the learning process itself, as well as the reflective process of self-directed learning, and the implications of this process for improvement (Caffarella, 1993; see also Garrison). These various aspects of the self-directed learning process can be related to several philosophical influences.

Philosophical influences on self-directed learning.

Four main learning philosophies have contributed to the concept of self-directed learning: humanistic philosophy, behaviorist philosophy, critical perspective, and progressivism (Caffarella 1993). The humanistic orientation has provided the main focus of self-directed learning by placing the learner at the center of the learning process. In this view of learning, the learner is expected to assume primary responsibility for the learning process. Additionally, the humanistic view describes the instructor or teacher as more of a facilitator or guide to learning, with less control over the learning process.

The behaviorist philosophy is also evident in the basic concepts of self-directed learning. The emphasis here is on the process that should be included in the learning

activity. Often this philosophy takes the form of plans, learning contracts, and learning objectives used to provide structure to learning process. This view has contributed to the idea that self-directed learning should be measurable and proven as a valid and quality experience for the participant.

Critical perspective is a view that has been recently examined for its relevance to self-directed learning (Caffarella, 1993). This philosophy centers on the reflective process of learning and its usefulness in bringing about change in individuals, society, and organizations. This involves the critical evaluation of policies and procedures, as well as organizational structure and processes, for relevance and meaning. Caffarella also reported that self-directed learners are more likely to explore alternative perspectives and systems of meaning in an attempt to positively alter personal, organizational, political, and social systems.

The idea of critical perspective is related to progressivistic thought. Critical reflection is the mechanism to provide impetus for change in the world that learners live and operate in. Additionally, the learner's experiences are central to the learning process and provide for a continuous progression of growth. This philosophy also views learning as pragmatic and practical in nature, and is applied directly to the life of the learner, thus providing for personal development and improvement. These philosophical influences and concepts have impacted the models of self-directed learning that have been promulgated in the literature.

A model of self-directed learning has been proposed (Garrison, 1997). This model that included three overlapping dimension of self-directed learning: self-management (control of the tasks of learning), self-monitoring (cognitive responsibility), and

motivation (for entering the learning, as well as for working on the tasks of learning). The dimension of self-management centered on the control of the learning tasks, and was concerned with the external activities of the learning experience. This included goal management, methods of learning, as well as the assessment and evaluation of learning. The other aspects of the model, motivation and self-monitoring, addressed the cognitive aspects of the self-directed learning process. The dimension of motivation in this model focused on two specific aspects of the motivational process: motivation to enter the learning experience, and motivation to continue on task and persist in the learning experience.

The focus of this study is the self-monitoring dimension, which included the learner being responsible for the learning process, but also addressed the learner's responsibility for the construction of personal meaning. The learner is responsible for constructing personal meaning through critical reflection and must assimilate and accommodate the new knowledge with previous knowledge. This model attempted to combine the management of the learning experience with the cognitive behaviors of the learner that are needed to sustain and create meaning in the self-directed learning process.

Assessment of self-directed learning.

Two instruments have been developed for the assessment of self-directed learning and have been reported in the literature. Guglielmino's Self-Directed Learning Readiness Scale (SDLRS) was created in 1978 and while it has been often used, it has undergone increasing scrutiny in the literature (Garrison, 1997). The discussion has included questioning the validity of the instrument, and whether the instrument really measures self-directedness. It has been suggested that the instrument may actually measure

readiness to learn, not necessarily readiness to learn in a self-directed manner. Garrison pointed out tha the other instrument, Oddi's Continuing Learning Inventory, also may have similar difficulties. The Oddi instrument was designed to show personality disposition towards self-directed learning and is the basis of the Brockett and Hiemstra model of self-directed learning. However, recent discussion by Garrison has indicated that the Oddi instrument may mostly measure motivations disposition. While both of these instruments have made positive steps in the assessment of self-directed learning, neither has focused on the cognitive aspects relating to the learning process.

Self-Regulation

Self-regulatory systems lie at the heart of human agency (Bandura, 1991). Motivation and action are not just determined by external rewards or punishments but are regulated by intentional forethought and self-reflection. Bandura described three main mechanisms of self-regulatory systems: self-observation, judgmental processes and self-reaction.

Self-observation skills assist individuals in two main ways (Bandura, 1991). First, self-observation, or self-reflection, has a self-diagnostic function, which allows people to monitor their reactions, achievements, thought patterns, etc. This self-diagnostic skill provides the guidance and direction for self-regulation. Secondly, self-observation functions as self-motivation. As people reflect, they are more likely to use goal setting and be self-directed in their actions. This ability to reflect and self-motivate may be important to learners participating in online instruction. Shomaker (1998) claimed that students in distance education must have a high tolerance for ambiguity and be independent learners.

The second mechanism, self-judgement, influences how a person evaluates their performances. People develop internal, personal standards of what is acceptable and what is not. Additionally, these self-judgements are often referenced to standard norms or compared to other persons either individually or collectively. Self-judgment also includes value judgments of the importance of activities, which relates to motivation and self-regulation. Finally, self-judgements relate to determinants of actions. If they feel that they are not at fault for a poor performance or feel that the external demands were too great, they are less critical of themselves (Bandura, 1991).

The third mechanism of self-regulation, self-reaction, relates to viewing personal performances positively or negatively based on personal standards. People tend to prefer positive self-reactions and positive tangible outcomes and work towards attaining these, providing personal motivation. This motivation has been found to be greater for those people who make self-satisfaction or rewards contingent upon completing particular events (Bandura, 1991).

Self-efficacy affects each of these self-regulatory mechanisms. Self-efficacy affects perceived causes of successful performances and poor performances, with high self-efficacy being related to insufficient effort, whereas low self-efficacy is often associated with low ability. High self-efficacy can result in people setting higher goals for themselves and can influence on the valuation of activities. When people perceive themselves as being self-efficacious in an activity, they show sustained increased interest in the activity.

The relationship between self-efficacy for self-regulated learning and academic performance in specific learning domains has been examined (Williams, 1996). The

study included 103 high school students who attended an ACT preparation workshop for English, mathematics, reading, and science domains. The pre-test/post-test design used the self-efficacy for self-regulated learning (SRL) instrument from Bandura's Multidimensional Scales of Perceived Self-Efficacy. The researcher also controlled for test anxiety and used the Worry – Emotionality Scale (Morris, Davis, & Hutchings, 1981). Williams found that students higher in self-efficacy beliefs for self-regulated learning also tended to have higher academic achievement. This result was found for all four study areas. In examining the specific associations of self-regulatory self-efficacy to academic performance by domain area, Williams found stronger correlations with those subjects that had verbal content rather than mathematical content (English r =.34, Mathematics r =.20, Reading r =.32, and Science r =.43). Williams concluded that the focus on detailed rules and the nature of mathematics contributed to this effect and that in verbal domains known skills are more applicable to new material.

From this review, it is clear that self-regulation plays a role in the instructional process and is related to the concepts of self-efficacy (Bandura, 1997; Howard-Rose & Winne, 1993; Williams, 1996; Zimmerman & Kovach, 1996). While the role of self-regulation in the domain of online instruction as an instructional presentation method seems certain, its relationship as an important characteristic of online instruction self-efficacy is unclear.

Critique of the Validity of Appropriate Theory and Research Literature

The theory and research literature presented in the review of literature provide an accurate view of the current status of online instruction and self-efficacy research. While

research in these areas has been systematic, there are several areas of concern regarding validity of the research. Specifically, several of the studies of online instruction self-efficacy have not had the level of task domain specificity that is required to properly assess self-efficacy beliefs. Assessing generalized self-efficacy is less robust than investigating self-efficacy beliefs related to specific tasks. Additionally, some of the research studies have not included enough levels of task difficulty to discriminate online instruction self-efficacy sufficiently. While one's self-efficacy for an easy task may be strong, it cannot be assumed that the person will have same strength of conviction when self-assessing their capabilities related to a more complex task.

Another area of concern with the research literature is content validity. Assessing self-efficacy beliefs towards a variety of specific computer tasks cannot alone be used to investigate online learning. Online instruction is a complex instructional process, of which one of the tools is a computer. Addressing content validity through a logical process of literature review and expert review can be used to ensure that the study assesses all relevant aspects of the task. Face validity can also be addressed in this manner.

Summary of Related Literature

It has been argued and demonstrated by Bandura (1997) that self-efficacy is reasonable construct to be used in assessing personal beliefs about capabilities and can be a more significant predictor of subsequent performance than other potential indicators. It is known that self-efficacy beliefs can, and should, be assessed along dimensions of level of belief, generality of belief, and strength of belief to have explanatory and predictive

value. Additionally, the self-efficacy literature has emphasized that generic measures of efficacy, divorced from a specific task domain are of limited use.

The online instruction literature has not produced a definitive list of the activities and skills involved in online learning. Several attempts to describe online learning have been made, giving an incomplete look at the components of online learning (Kahn, 1997; Harasim, 1990), however a complete list of the components of online learning is unlikely since online instructors use a variety of methods and the technology is continually growing.

The field of research into self-efficacy related to computers and instruction has produced some interesting results. A positive relationship between self-efficacy and motivation to learn from online instruction is reported in some studies (Reinhart, 1999). Research has also shown that participants with higher perceived online instruction self-efficacy engaged in more strategies and higher order strategies than participants with lower online instruction self-efficacy. There is not clear evidence regarding gender and computer self-efficacy and gender effects are mixed (Murphy, Coover, & Owen, 1989; Qutami & Abu-Jaber, 1997; Torkzadeh & Koufteros, 1994). Unfortunately, most of the research involving self-efficacy has focused on computer usage and not on online instruction in particular. In summary, while some research into self-efficacy and instruction has been undertaken, the body of literature related specifically to online instruction self-efficacy is lacking and needs to be advanced.

CHAPTER III

Research Procedures

This chapter details the research procedures used in this study. The research methodology, specific procedures used, a description of the research population and sample, instrumentation, pilot testing, data collection, and treatment of the data are the subsections that are described.

Research Methodology

Using research descriptions by Miller (1991) and Isaac and Michael (1995), the overall research strategy in this study is oriented toward basic research to develop a survey instrument to measure self-efficacy beliefs related to online instruction. More specifically, the proposed study is both correlational and descriptive in method since the survey instrument will be used to both investigate the relationships between variables and to describe the subject's self-efficacy beliefs towards online instruction. The correlational method of research is described as an investigation of "...the extent to which variations in one factor correspond with variations in one or more other factors based on correlational coefficients" (Isaac & Michael, p. 53). This is an appropriate description of part of the objectives of this study, specifically the analysis of relationship among self-efficacy beliefs and demographic factors, as well as the investigation of relationship in survey items using factor analysis. Factor analysis, one of the primary methodologies for this study, is considered a correlational research procedure (Thomas & Nelson, 1990).

In addition to the correlational method of research, descriptive methods will be used to satisfy the study objectives. Issac and Michael (1995) claimed that the descriptive method of research seeks to systematically and factually describe a population or

construct but "...does not necessarily seek or explain relationships, test hypotheses, make predictions, or get at meanings and implications" (p. 50). However, Issac and Michael also explain that descriptive methods are often incorporated into other research methods, which is the case with this study. While this study was focused on modeling online instruction self-efficacy and explaining relationships, a secondary concern was to examine the sample population responses to the online instruction self-efficacy survey. In meeting the goals for this correlational and descriptive study, three primary methodologies were used.

1. Psychometric techniques and methodologies (Bandura, 1997; Isaac & Michaels, 1995; Miller, 1991; Nunnally & Bernstein, 1994; Spector, 1992) were followed in the development of the online instruction self-efficacy survey instrument.

2. Exploratory factor analysis methodologies (Nunnally & Bernstein, 1994; Rencher, 1995; Cureton and D'Agostino, 1983; Gorsuch, 1983) were used to simplify and expose the underlying factors impacting online instruction self-efficacy.

3. Descriptive statistical procedures (Isaac & Michaels, 1995; Nunnally & Bernstein, 1994; Rencher, 1995) were used to examine the individual survey items, specific identified factors and related items according to demographic variables, and overall demographic item significance.

Overall Research Approach

The overall research approach for this study followed Spector's (1992) major steps in developing a survey instrument, combined with psychometric theory guidelines for assessing psychological phenomenon (Nunnally & Bernstein, 1994; Miller, 1991), and utilizing Bandura's (1997) procedures for creating self-efficacy assessments (discussed in detail in the Instrumentation section), and is shown in Figure 3.

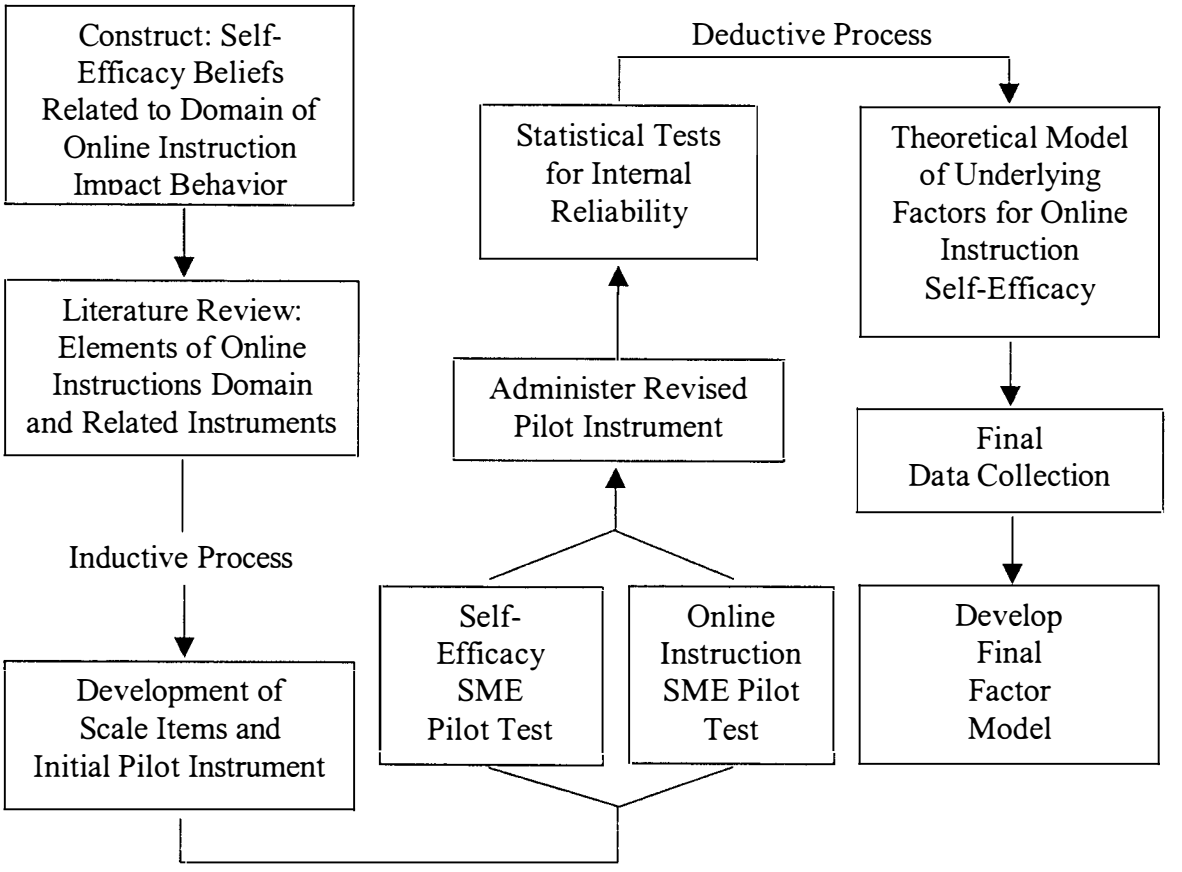

Figure 3
Overall research approach.

In brief, the procedure for this study followed an inductive process in creating the online instruction self-efficacy survey, and then followed a deductive process in testing the final instrument and generating the underlying theoretical model through factor analysis. This process is described in greater detail in the Specific Procedures section of this chapter.

Specific Procedures

In this research endeavor, first the online instruction self-efficacy construct was defined and important characteristics of online instruction were gathered and developed into a theoretical model. Next, survey items were written based on that model (elaborated upon in the Instrumentation section), and refined through the use of a group of subject matter experts (further discussed in the Pilot Testing section). After pilot testing the revised instrument for item clarity, internal consistency, and reliability with a small group, the completed survey was used to gather the sample data (fully detailed in the Population section). Once these final data were gathered they were analyzed using exploratory factor analysis methodologies, descriptive statistics, and a final analysis of the survey items (detailed in Treatment of the Data section).

Research Population and Sample

The research population for this study consisted of electrician instructors from the National Joint Apprenticeship Training Committee (NJATC), which is cosponsored by the International Brotherhood of Electrical Workers (IBEW) and the National Electrical Contractors Association (NECA). These instructors are responsible for training electrician apprentices during a 5-year apprenticeship program. While providing training to apprentices, these instructors are also continuing their own professional development

by participating in a 4-year Instructor Training Program offered by the NJATC at the University of Tennessee, Knoxville that trains the instructors on current instructional tools, techniques and technologies.

At the time of this study, the NJATC organization was exploring the use of online instruction in training electrician apprentices and would benefit from this attempt to investigate the relationship between self-efficacy and online instruction for their instructors, as well as their apprentices. This population was a good choice for this study since it was deemed that the group would: (a) have a range of computer and Internet experiences, (b) were currently participating with job training, and (c) were employees in an organization using online instruction to some extent in training their electrician apprentices.

Permission to conduct the study was obtained from the Executive Director of the NJATC (see Appendix A) and the TOIS instrument administered to the NJATC instructor population attending the organization's annual National Training Institute (NTI) during the period of August 4^{th} – 11^{th}, 2001. This institute is a major component of the 4-year Instructor Training Program. All 841 instructors attending this conference were asked to voluntarily participate in this study.

This study employed a purposive but non-probability sampling method and allowed participants to volunteer for participation in this study. The NJATC electrician instructor population used in this study was purposively chosen for their participation in continuing professional development and potential for participating in online instruction. The non-probability sampling method used for the study did limit the inferences that can be made back to the population of instructors attending the institute, however

generalizing results to the population, while useful, is not necessary for the factor analysis procedures used in this study (Nunnally & Bernstein, 1994).

Instrumentation

Creation of the TOIS followed Spector's (1992) summated rating scale suggestions, as well as Bandura's (1997) discussion of creating assessments of self-efficacy. Spector identified four characteristics of survey instruments:

1. The survey must contain multiple items.
2. Each item must measure a concept or thing that uses a quantitative measurement continuum.
3. Each item does not have a "correct" answer.
4. Items are presented as a statement.

Bandura (1997) gave several recommendations regarding the structure of self-efficacy belief that impact how the construct should be measured:

1. Self-efficacy is not personal skill; instead, it is a measure of personal belief about the use of those skills under difference sets of conditions.
2. Instruments should examine self-efficacy at different levels of performance. "Sensitive measures of efficacy beliefs link operative capability to levels of challenge in particular domains of functioning" (Bandura, 1997, p. 38).
3. Self-efficacy should not be reduced to beliefs about motor behaviors divorced from context. The measurement of efficacy for subskills detached from the appropriate behavioral context would provide an inaccurate view of self-efficacy.
4. Self-efficacy is more than the belief in capability to perform subskills of a task. It is possible to have high belief in the ability to perform the component parts of a skill and have low belief in your ability to coordinate these component skills, or to use those skills under demanding conditions.
5. Self-efficacy must be assessed specific to the activity domain. Efficacy beliefs in one sphere of activity will not necessarily be duplicated in other activities

and global or general assessments of self-efficacy are too decontextualized.

Bandura (1997) also gave specific guidelines regarding the structure of self-efficacy survey instruments:

1. The dimensions of self-efficacy have great implications to performance and must be assessed. The level, generality, and strength of self-efficacy beliefs are assessed in the instrument in different ways.

    a. The level of self-efficacy belief should be assessed through multiple items representing different levels of demand within the activity domain. These levels of challenge or obstructions to performance should be based on analysis of the activity domain and expert knowledge of the area. Additionally, this information should be subsidized with interviews, as well as open-ended and structured surveys.

    b. The generality of self-efficacy belief should be assessed by surveying self-efficacy belief in a variety of situational contexts related to the activity domain. Generality can differ by similarity of activity, whether the performance is expressed in behavior, cognition, or affect, qualitative situational features, or the personal characteristics of the person viewing / evaluating the performance (Bandura, 1997).

    c. The strength of self-efficacy belief is assessed by respondents recording the intensity of their self-efficacy beliefs using a rating scale of some sort. Bandura suggested a 100-point rating scale be used ranging from 0 to 100 with ten point interval. In this scale, zero represents "can not do", 50 represents "moderately certain can do", and 100 represents "certain can do". Bandura also stated that some researchers use a zero to ten choice scale instead of 0 to 100, but warned that reducing ratings to too few steps would result in less sensitivity.

2. Items should be phrased in "can do" terminology rather than "will do", since "can" shows capability of action while "will" involves intent to act.

3. Multidimensional self-efficacy surveys, appropriate to the activity domain, should be used if the component subscales are demonstrated to be part of the domain being assessed, yet measure different aspects of the same phenomenon.

4. Confounded instruments that assess characteristics other than belief in capability to perform in a given situation, such as measures that include assessment of emotional and motivational effects of efficacy, should be

avoided.

5. Testing techniques to minimize respondents' concern regarding possible social reactions to their ratings should be used. These techniques would include allowing participants to make their self-efficacy judgements privately and without identification, and using instruction language that emphasizes frank judgement during self-assessment.

6. The hierarchical structure of self-efficacy surveys should either be random in order or ascending in order of task demands. Bandura cited research that ordering items from most to least difficulty can effect self-efficacy judgments.

7. If the activity being measured consists of multiple domains, it is better to use well-designed measures of self-efficacy from multiple domains than to use omnibus measures of self-efficacy. In the preferred scenario, the scores of the multiple self-efficacy measurements would be combined resulting in a more valuable, predictive measure.

8. It is appropriate to examine self-efficacy beliefs in a generic setting with an intermediate level of generality. Bandura (1997) discussed the use of three levels of generality in assessment, which is chosen based on the particular type of measurement situation. At the most specific level, self-efficacy for particular performance is judged related to a specific situation. The intermediate level of generality examines self-efficacy for a group of performances related by domain under a set of conditions that share some common elements. Finally, the most general level assesses self-efficacy judgements but does not use specific performances or conditions. As discussed previously, the most general level would lack great predictive ability.

9. While working towards a workable set of instrument items that can be implemented in a brief time period, researchers should not reduce the magnitude of the assessment as to lose the benefits of the self-efficacy construct. Bandura warned against producing decontextualized instruments that lack sufficient range of task challenge, which "...sacrifice predictive power for operational feasibility" (1997, p. 50).

These recommendations by Bandura (1997) along with the specific procedures suggest by Spector (1992) for developing survey instruments were used as guidelines for creating the Tennessee Online Instruction Survey (TOIS), as seen in Appendix B, which was examined in this study. Following Bandura's recommendation when assessing self-

efficacy related to multi-domain behavior, this instrument would include component areas demonstrated to be of significance in online instruction. As described in the conceptual and theoretical framework for the study, the following five identified component areas were developed to guide the item writing process:

1. An online activity area of questioning based on Khan's (1997) components and features of online instruction, along with other literature, was devised to examine self-efficacy for online instructional skills.

2. A line of questioning to survey one's self-efficacy beliefs about instructional elements / learning modes was developed based on unique characteristics of the online instruction domain, including online testing, and use of audio, video, and screen information presentation methods.

3. Self-efficacy beliefs related to communication skills and collaborative efforts via the Internet and World Wide Web were assessed as a component area for questioning.

4. Learners' self-efficacy judgements about self-regulatory / self-directedness skills during online instruction were also considered in the development of the instrument. This component area assessed self-efficacy related to entering motivation, task motivation and perceived self-reflection skills in online instruction and self-regulatory skills.

5. An area of questioning was developed for self-efficacy related to computer skills for those elements and technologies deemed essential to the online instruction experience.

Following the guidelines and recommendations by Bandura (1997) and Spector (1992), the researcher used these five areas of potential online instruction self-efficacy items to generate a preliminary list of approximately 120 survey items. Next, these 120 items were examined for clarity, overlap, specificity and content with several students and professors with online instruction experience and reduced to 65 items. This reduced item list was used to create an online form to examine the face validity of the survey using identified subject matter experts, as discussed in the Pilot Study section.

Though Bandura (1997) suggested a 100-point scale for surveys assessing self-efficacy, a seven-point interval scale was selected for this instrument, which is consistent with psychometric theory presented by Nunnally and Bernstein (1994). The interval scale used for the TOIS ranged from one, representing the subject's belief that they could "never" complete the item statement, to seven, representing the subject's belief that they could "always" complete the item statement. Intermediate steps of two through six represented subject responses they could "almost never", "seldom", "sometimes", "usually", or "almost always" complete the item statement, respectively, as seen in Appendix B.

The item location on the final survey instrument was randomly determined. Items were assigned a preliminary number and then randomly reordered by locating that preliminary number on a random number chart. Closely related items that that ended up near each other in the first placement were randomly reassigned another location. The final item locations were the same for both the second phase of the pilot study and the final administration.

While the use of negative items is often suggested to avoid response sets (Miller, 1991), it was decided that negatively worded items did not fit well with the attempt to measure self-efficacy. Asking a person to rate their belief in their ability to not do a task, or to do something improper did not make sense for this research. The final instrument only contained positively worded statements.

Pilot Study

The TOIS was piloted in two different phases, first to assess face validity, and subsequently to examine item clarity and reliability. As described by Nunnally and

Bernstein (1994), face validity can be viewed as an aspect of content validity, but is examined after the instrument has been developed as "...an inspection of the final product to make sure that nothing went wrong in transforming plans into the completed instrument" (Nunnally & Bernstein, p. 110). Since this study involved two areas, namely online instruction and self-efficacy, it was decided that two different groups would be polled as subject matter experts. One group was selected based on expertise in online instruction, and the other with expertise in social cognitive theory and the concept of self-efficacy. These two groups were asked to assess the face validity of the reduced 65-item list.

Two subject matter experts volunteered to assess the face validity of the 65 items based on their expertise with self-efficacy research and construct assessment. The face validity examination was made available in an online format, and a print version is provided in Appendix C.

The second group of subject matter experts was selected based on their expertise working in the field of online instruction and participating members of an Internet newsgroup labeled "www_dev". This newsgroup is an Internet discussion group for person involved in creating or implementing online instruction, and is frequented by both academic and corporate instructors and designers. These experts were solicited to provide feedback on the face validity of the online instruction components assessed by the designed survey instrument, and to ensure that the instrument captured the essential elements of online instruction. To facilitate their inspection of the proposed items, a description of the research and a link to an online version of the 65-item survey to the www_dev newsgroup. The survey and directions given to this group is located in

Appendix D. From this solicitation, five responses were received that were deemed adequate, based on the reviewer's self-reported experience with online instruction.

In addition to the newsgroup participants, a professor at the University of North Carolina, Chapel Hill, also an editor for a refereed online instruction journal, participated in this phase of the pilot testing. Based on results obtained from these two groups examining the face validity of the TOIS instrument, it was determined that several items could be combined or eliminated from the survey instrument reducing the total items to 40.

After revision/reduction of the survey item statements and inclusion of the seven-point interval response scale, the 40-item survey was pilot-tested with a sample of convenience that included 30 college students and persons involved with professional development. Of the 30 surveys returned, 26 were deemed complete and usable for analysis. Results of this second phase of pilot testing focused on assessing item clarity and item total reliability coefficient (discussed in Chapter 4). Statistical analysis showed a reliable structure for the 40-item survey. Based on this final phase of pilot testing, there was no need seen to revise the survey instrument further and the final TOIS instrument was established.

Data Collection

The final administration of the TOIS instrument was given to the NJATC instructor population attending the organization's annual National Training Institute (NTI), during the period of August 4th – 11th, 2001, as discussed in the Research Population and Sample section. The 45 group leaders of NTI were asked to implement the survey instrument with the class they were responsible for. To accomplish this, the

group leaders were met before the institute and the survey instrument and self-efficacy concept, as well as explained the data collection procedure was described and the group leaders were given a packet of TOIS forms sufficient for their class size. Group leaders were asked to distribute the survey instrument to their students (the electrician instructors) during the first day of the institute, to give the class appropriate time to complete the survey, and to collect and return their completed responses at the end of that first day of classes.

While most surveys packets were completed and returned after the first day, approximately 25% of the total surveys retrieved were returned during the next four days of the institute. A variety of reasons accounted for this delay. Some group leaders had the surveys completed on the first day and forgot to turn in the survey packets at the end of the day, while others forgot and did not have the survey completed until the second day of the institute. Some packets of surveys were returned after the first day but without any explanation for the delay. These delays in returning the survey data were not seen as a significant problem for the study methodology or an issue for data exclusion. Of the 841 institute participants, 762 electrician instructors voluntarily participated and returned survey instruments, resulting in a 90.6% return rate. All returned surveys were used for the subsequent data analysis.

Data Entry Process

Since the final data for this study was collected by paper and pencil methods, a data verification procedure was necessary to validate the data entry process. First, each returned survey was labeled sequentially from 1 to 762 for easier record keeping and data verification. Next, to ensure accurate data, the entire survey dataset twice, via two

different spreadsheet files, and the two datasets were statistically compared for mismatched entries. Of the 73,152 spreadsheet cells entered (36,576 data points completed twice), 54 mismatches between the two datasets were found and corrected by visual comparison with the corresponding returned survey. While it was possible that the same error was made in entering the data in the same location on both datasets, this seemed unlikely and it was concluded that the dataset was acceptably accurate for subsequent analysis.

Treatment of the Data

Results are reported in the next chapter, however this section outlines the data analysis procedure followed. The data analysis focused on answering the two main research concerns for the study: (a) Identifying the salient factors of online instruction self-efficacy, and (b) Examining subjects' self-efficacy beliefs based on demographic variables of gender, educational achievement, age, extent of computer experience, extent of personal online instruction learning experiences, and extent of Internet experiences.

All statistical analysis was completed using the Statistical Package for the Social Sciences for Windows (SPSS) version 10.0. To accommodate missing data points a method of excluding cases with missing data, relevant to the question item, for all factor analysis, item analysis, and demographic statistics. As evidence of the acceptability of this practice, the initial factor analysis procedures were analyzed with three different methods of missing data accommodation without any significant change in the factor loadings or structure. The specific analyses used in this study were based on two distinctions: treatments used for item and demographic analysis, and exploratory factor analysis procedures, as next discussed.

Item and Demographic Analysis

The specific data treatment methods used for examining the individual survey items and demographics included summary descriptive statistics and demographic analysis using Multiple Analysis of Variance (MANOVA) procedure with follow up post-hoc tests for significant findings. Summary descriptive statistics used included frequency count, percentage, mean and standard deviation. Additionally, the resulting factor structure revealed was examined by factor and demographic variable and reported using descriptive statistics. The MANOVA test was used to determine significance for demographic variables compared to the dependent variables, i.e., the factors uncovered in the factor analysis procedure. Significant results for each demographic variable were then examined by individual ANOVA and significant factor effects were then subjected to post hoc test for comparison of group means using the Tukey-Kramer post-hoc test (Kramer, 1956).

Factor Analysis

Factor analysis was used to examine the salient characteristics and structure of the online instruction self-efficacy for this sample data. Nunnally and Bernstein (1994) stated, "factor analysis is at the heart of the measurement of psychological constructs" (p. 111). Factor analysis is a correlational research procedure that helps the researcher determine relationships among a number of variables and seeks to reduce the variables to smaller combinations of factors (Thomas & Nelson, 1990; see also Nunnally & Bernstein). Similarly, Cureton and D'Agostino (1983) described factor analysis as "a collection of procedures for analyzing the relationships among a set of random variables observed or counted or measured for each individual of a group" (p. 1). The goal of factor

analysis, as described by Gorsuch (1983), "... is to summarize the interrelationships among the variables in a concise but accurate manner as an aid in conceptualization (p. 2). This procedure was appropriate to identifying and understanding the salient characteristics of online instruction self-efficacy for this study.

The particular form of factor analysis procedure used for this study was exploratory factor analysis. Exploratory factor analysis, as described by Thompson and Daniel (1996) seeks to understand the underlying factor structure without consideration of the theoretical expectations of the researcher. On the other hand, confirmatory factor analysis is used when a strong empirical base exists, the number of factors is fixed, and the variables are fixed to load on specific hypothesized factors (Stevens, 1996). Exploratory and confirmatory factor analysis procedures can be viewed as a continuum based on the degree of theoretical base and empirical knowledge (Nunnally & Bernstein, 1994).

The specifics of this study lied closer to the exploratory end of the continuum rather than the confirmatory extremity. While empirical evidence for self-efficacy in several different domains exists, and a theoretical model was proposed, there was little self-efficacy research available specific to the domain of online instruction, and no defined, tested relationship among factors was available. Nunnally and Bernstein (1994) stated that "investigators usually have some hunches, perhaps implicitly, about at least some of the underlying factors, but these may not be completely firm" (p. 450). This type of situation is appropriate to exploratory factor analysis procedures; however, exploratory analyses with no theoretical rationale are cautioned against. This research endeavor did have a theoretical basis used to develop the TOIS as well as provide a framework for

selecting, interpreting, and relating factors to online instruction self-efficacy. Additionally, Rummel (1970) stated that this form of factor analysis was appropriate when a researcher hypothesized the existence of particular factors and then completed factor analysis to see if the hypothesized dimensions emerged from the data. These arguments provide evidence for the use of exploratory factor analysis in this study, which was used to answer the first research question, as presented in Chapter I.

The exploratory factor analysis procedures used for this analysis included orthogonal (Varimax with Kaiser normalization) rotation and a principal component factor extraction method. There is much debate in the literature regarding the choice of orthogonal vs. oblique rotation in factor analysis methods, as well as the method of extraction used. Reagan (2000) argued that since orthogonal rotation is actually just a special case of the oblique rotation and no controversy between using oblique versus orthogonal rotation should exist. For this study, the researcher concluded to only use orthogonal rotation, based on discussion of the topic by Nunnally and Bernstein (1994), who professed a "mild" preference for orthogonal rotation, and discussed the following merits:

1. Orthogonal rotation is mathematically simpler than using oblique rotation.
2. Orthogonal rotation is generally accepted as easier to generalize to other research and datasets, whereas oblique rotations are designed to best fit the original data.
3. Often the two different rotations lead to essentially the same conclusions.

Furthermore, Rummel (1970) stated that orthogonal rotation allows for patterns to be more easily communicated, loadings can be interpreted as correlations, and orthogonal factors are more amenable to subsequent mathematical analysis. The principal

components method of extraction is the most commonly used method of variable extraction (Rummel, 1970) and was selected for use in this study, even though other methods of extraction such as the maximum likelihood method and unweighted least squares method are also available.

Reagan (2000) suggested that the researcher set an acceptable variable loading for the rotated factor structure be set. In this analysis, the researcher set a decision rule of .50 for variable loadings for the question item to be retained in the factor model. The .50 cutoff decision rule for loadings was appropriate based on visual examination of the relative factor loadings and was typical based on the decision rules set by other researchers: .48 (Stone, 2000); .45 (Jackson, Furnham, Ford & Cotter, 2000); .40 (Worrell, 2000); .32 (Reagan, 2000); .30 (Lyne, Barrett, Williams & Coaley, 2000). Other statisticians have suggested that the typical choice of .30 for loading cutoff decisions is too low. Rencher (1995) stated that while .30 is often advocated, "...a target value of .50 or .60 is more typical" (p. 476). This research was held to the higher standard. Results of the exploratory factor analysis procedures are presented in the next chapter.

Summary

The primary purpose of this study was to develop the TOIS to assess online instruction self-efficacy, use exploratory factor analysis procedures to determine the salient characteristics of online instruction self-efficacy for the sample data, as well as examine several demographic variables of the research population. This section detailed the specific research procedures used for this study, including a description of the research population and sample, a discussion of the development of the TOIS, the

methods used in the pilot test and final administration of the instrument, and a discussion of the data entry and validation process. Finally, the data analysis methodology using factor analytic, descriptive, and MANOVA procedures was discussed.

CHAPTER IV

Findings

The primary goals set for this study were to develop the TOIS to measure online instruction self-efficacy and to derive a factorial model based on exploratory factor analysis procedures. A secondary goal was to describe the results of the instrument with the NJATC instructor sample as well as compare the demographic variables of gender, educational achievement, age, extent of computer experience, extent of personal online instruction learning experiences, and extent of Internet experiences to self-efficacy beliefs. Presented in this chapter are the findings of the second phase of the pilot test, as well as the final implementation of the TOIS. Final implementation findings include the factor analysis results for the final TOIS instrument, the MANOVA analysis of the demographic variables, and the post-hoc tests. Descriptive statistics for the TOIS items were also completed and reported. The findings are presented to answer the two research questions presented in Chapter I, and the six research hypotheses.

Results of the Pilot Study

The second phase of the pilot study examined the revised instrument with a group of college students and persons involved with professional development through an online course. The second phase of pilot testing was aimed at assessing item clarity and reliability, and this exploratory pilot examination did not test any specific hypotheses. Due to the sample size ($n = 26$), initial factor analysis was not attempted. Appendix E contains the specific frequency counts, means and standard deviations for this pilot examination.

The coefficient alpha statistic was used as a measure of internal consistency for the pilot study. As described by Nunnally and Bernstein (1994), coefficient alpha provides a good estimate of reliability for new instruments. Reliability coefficients between the ranges of .60 and .80 are acceptable for sample sizes of 300 or more, according to Nunnally and Bernstein. To examine the reliability of the pilot study data, the researcher grouped related items since no factor structure had yet been tested. The 40 items were grouped according the perceived function: (a) online course activities (10 items), (b) self-regulation (10 items), (c) collaborative (6 items), (d) communication (8 items), and (e) learning methods / learning preferences (6 items). Appendix E contains the individual items and groupings used. Table 3 shows the internal reliability analysis of the pilot data by item grouping. The reliability was acceptable for item groupings, since all coefficients were above .90. Also, the overall reliability coefficient for all 40 items was .98. The survey instrument had sufficient internal reliability, based on this pilot data, did not need revision; and it was accepted as the final form for the TOIS instrument.

Table 3
Internal Reliability Coefficients for Pilot Data

Item Grouping	Survey Items Included	Cronbach's Alpha
Online course activities	10 total items (Q2, 6, 8, 9, 10, 12, 20, 21, 25, 36)	Alpha = .949
Self-Regulation	10 total items (Q3, 4, 7, 16, 17, 19, 23, 30, 33, 38)	Alpha = .970
Collaboration	6 total items (Q1, 24, 28, 29, 31, 34)	Alpha = .938
Communication	8 total items (Q11, 22, 26, 27, 32, 35, 39, 40)	Alpha = .934
Learning methods / preferences	6 total items (Q5, 13, 14, 15, 18, 37)	Alpha = .917
Overall reliability test for 40-item pilot test:		Alpha = .980

Results of the Final Instrument Testing

The TOIS instrument was used with the final research population, as described in the data collection section of Chapter III, after the pilot testing was completed. Descriptive statistics for the 40 items in the final TOIS instrument and statistical analyses, designed to address the research questions and hypotheses posed in Chapter I, are presented next.

Descriptive Statistics

The TOIS included 40 self-efficacy statements and well as six demographic variables. Table 4 shows the descriptive statistics for the final dataset, including individual item means and standard deviations for each of the 40 items on the final TOIS instrument. Table 4 also includes the frequency counts and percentage of responses for each of the seven Likert scale choices. As shown, item means ranged between 4.35 (items 14 and 29) and 5.74 (item 4). The lowest mean scores reported were for statements to "evaluate the quality of information found on a website" (item 14) and to "organize and lead a course project involving other participants" (item 29). The highest mean score was for the statement to "work alone" (item 4). Standard deviations for the 40 items ranged between 1.21 (items 17 and 32) and 1.82 (item 36).

Demographic variables gathered in this study included participants' age, level of educational attainment, extent of computer experience, extent of online instruction experience, and extent of Internet experience. In the final data collection, gender was heavily skewed towards males, as expected. Of the 762 survey respondents, 31 (4.1%) reported being female, while 721 (95.9%) respondents reported being male. Ten people left that item blank.

Table 4

Descriptive Statistics for Final TOIS Study

Item	Number and Percentage of Responses							*n*	Mean	SD
	Never	***Almost Never***	***Seldom***	***Sometimes***	***Usually***	***Almost Always***	***Always***			
1. Complete a project with other course participants	33 4.3%	34 4.5%	55 7.2%	163 21.5%	202 26.6%	159 20.9%	113 14.9%	759	4.84	1.54
2. Take an online test on course subject matter	28 3.7%	16 2.1%	24 3.2%	59 7.8%	147 19.4%	181 23.9%	303 40.0%	758	5.69	1.53
3. Stay involved with the course without face-to-face interaction with other course participants	31 4.1%	27 3.5%	86 11.3%	143 18.8%	194 25.5%	167 21.9%	113 14.8%	761	4.83	1.55
4. Work alone	13 1.7%	9 1.2%	22 2.9%	64 8.5%	170 22.5%	207 27.4%	271 35.8%	756	5.74	1.32
5. Learn from information presented in a video format	8 1.1%	6 0.8%	42 5.5%	72 9.5%	217 28.7%	247 32.6%	165 21.8%	757	5.49	1.23
6. Find my way (navigate) around websites	18 2.4%	16 2.1%	51 6.7%	116 15.3%	188 24.8%	176 23.2%	193 25.5%	758	5.30	1.47
7. Prioritize my own course activity workload	16 2.1%	16 2.1%	44 5.8%	140 18.5%	224 29.7%	205 27.2%	110 14.6%	755	5.11	1.34
8. Use an Internet browser	18 2.4%	23 3.1%	44 5.9%	97 12.9%	154 20.5%	174 23.2%	241 32.1%	751	5.44	1.53
9. Critique my instructor's performance in teaching the subject matter online	37 4.9%	27 3.6%	69 9.1%	133 17.6%	173 22.9%	173 22.9%	143 18.9%	755	4.95	1.62
10. View an attachment from an incoming email message	35 4.6%	18 2.4%	46 6.1%	78 10.3%	122 16.1%	171 22.6%	288 38.0%	758	5.51	1.67
11. Use email to communicate effectively with other course participants	32 4.3%	26 3.5%	47 6.3%	96 12.8%	136 18.2%	158 21.1%	254 33.9%	749	5.36	1.68

Table 4
Continued

Item	Number and Percentage of Responses							*n*	Mean	SD
	Never	***Almost Never***	***Seldom***	***Sometimes***	***Usually***	***Almost Always***	***Always***			
12. Download and install software for my Internet browser that is needed for the course	43 5.7%	30 4.0%	62 8.2%	88 11.6%	129 17.0%	161 21.3%	244 32.2%	757	5.23	1.78
13. Learn from the information presented in an audio format	13 1.7%	23 3.0%	57 7.5%	128 16.8%	229 30.1%	181 23.8%	130 17.1%	761	5.10	1.39
14. Evaluate the quality of information found on a website	21 2.8%	20 2.6%	50 6.6%	129 17.0%	203 26.7%	210 27.7%	126 16.6%	759	5.12	1.43
15. Make sense of ambiguous information.	36 4.7%	26 3.4%	100 13.2%	231 30.5%	233 30.7%	105 13.9%	27 3.6%	758	4.35	1.33
16. Follow standard online etiquette guidelines	20 2.6%	13 1.7%	36 4.7%	97 12.8%	187 24.6%	206 27.1%	201 26.4%	760	5.42	1.43
17. Keep myself on task.	12 1.6%	7 0.9%	41 5.4%	112 14.7%	262 34.4%	233 30.6%	94 12.4%	761	5.21	1.21
18. Learn from reading information presented on a computer screen.	9 1.2%	15 2.0%	30 3.9%	95 12.5%	222 29.2%	267 35.1%	123 16.2%	761	5.36	1.23
19. Assess my progress in a course.	17 2.2%	12 1.6%	33 4.4%	129 17.1%	256 33.9%	216 28.6%	93 12.3%	756	5.14	1.27
20. Learn to use new software required for the course	17 2.2%	18 2.4%	37 4.9%	135 17.87%	208 27.4%	194 25.5%	151 19.9%	760	5.22	1.40
21. Save a document from the Internet	26 3.4%	14 1.9%	41 5.4%	95 12.6%	139 18.4%	177 23.4%	264 34.9%	756	5.51	1.56
22. Address disagreements between course participants online	39 5.2%	26 3.5%	87 11.6%	157 20.9%	213 28.4%	150 20.0%	79 10.5%	751	4.66	1.52

Table 4
Continued

Item	Number and Percentage of Responses							*n*	Mean	SD
	Never	***Almost Never***	***Seldom***	***Sometimes***	***Usually***	***Almost Always***	***Always***			
23. Keep appointments to meet other participants online for scheduled events	30 4.0%	25 3.3%	94 12.4%	148 19.6%	210 27.7%	180 23.8%	70 9.2%	757	4.72	1.47
24. Participate in a discussion group in which the topic is discussed over a period of time by leaving a message for participants	33 4.4%	24 3.2%	96 12.7%	152 20.1%	191 25.2%	171 22.6%	91 12.0%	758	4.74	1.53
25. Find information on a website that offered a keyword search feature	24 3.2%	21 2.8%	39 5.1%	98 12.9%	175 23.1%	221 29.2%	180 23.7%	758	5.32	1.49
26. Communicate effectively when my responses will be read by many people.	22 2.9%	22 2.9%	52 6.9%	121 16.0%	233 30.8%	194 25.7%	112 14.8%	756	5.05	1.42
27. Use email to communicate effectively with my instructor	31 4.1%	23 3.0%	38 5.0%	104 13.7%	168 22.2%	202 26.7%	191 25.2%	757	5.28	1.57
28. Participate in a live online discussion in which course participants discuss a topic at the same time	35 4.6%	36 4.8%	97 12.8%	152 20.1%	202 26.8%	144 19.1%	89 11.8%	755	4.64	1.56
29. Organize and lead a course project involving other participants	42 5.6%	51 6.8%	105 14.0%	181 24.2%	197 26.3%	124 16.6%	49 6.5%	749	4.35	1.52
30. Stay involved with the course without face-to-face interaction with the instructor	29 3.8%	35 4.6%	63 8.3%	156 20.7%	209 27.7%	173 22.9%	90 11.9%	755	4.80	1.50

Table 4
Continued

Item	Number and Percentage of Responses							*n*	Mean	SD
	Never	***Almost Never***	***Seldom***	***Sometimes***	***Usually***	***Almost Always***	***Always***			
31. Participate in group decision making	23 3.0%	21 2.8%	66 8.7%	153 20.3%	224 29.7%	184 24.4%	84 11.1%	755	4.88	1.40
32. Understand what other people are trying to convey in their writing.	17 2.2%	21 2.8%	54 7.1%	147 19.4%	325 43.0%	151 20.0%	41 5.4%	756	4.80	1.21
33. Give myself enough time to complete assignments.	15 2.0%	19 2.5%	62 8.2%	138 18.2%	248 32.8%	204 26.9%	71 9.4%	757	4.96	1.30
34. Develop a relationship with another course participant	31 4.1%	33 4.4%	115 15.2%	167 22.0%	224 29.6%	138 18.2%	50 6.6%	758	4.50	1.44
35. Give constructive feedback to other course participants	19 2.5%	27 3.6%	69 9.1%	161 21.3%	252 33.4%	171 22.6%	56 7.4%	755	4.77	1.33
36. Attach a file to an email message	48 6.4%	32 4.3%	80 10.6%	116 15.4%	123 16.4%	137 18.2%	216 28.7%	752	5.01	1.82
37. Understand a concept from reviewing materials presented on several different websites	26 3.5%	24 3.2%	67 8.9%	127 16.9%	219 29.1%	194 25.8%	95 12.6%	752	4.93	1.46
38. Plan and manage my own learning needs.	17 2.2%	17 2.2%	53 7.0%	120 15.8%	246 32.5%	202 26.6%	103 13.6%	758	5.08	1.34
39. Communicate my thoughts and ideas in writing.	17 2.2%	15 2.0%	56 7.4%	131 17.3%	209 27.6%	213 28.1%	117 15.4%	758	5.12	1.38
40. Express my opinion on controversial subject matters.	20 2.6%	14 1.8%	47 6.2%	105 13.8%	187 24.6%	229 30.2%	157 20.7%	759	5.29	1.42

Figure 4 shows the age ranges reported for this study. Most respondents (75.7%) were between 31 and 50 years old. For this variable, no subjects reported being less than 20 years of age, 3 people (0.4%) were ages 21-25, 68 people (9%) were ages 26-30, 151 people (20.1%) were ages 31-35, 155 people (20.6%) were ages 36-40, 158 people (21%) were ages 41-45, 105 people (14%) were ages 46-50, 85 people (11.3%) were ages 51-55, and 27 people (3.6%) reported being 55 or older. Ten people (1.3% of the total sample) either did not respond to this item or the response was uninterpretable.

The survey also measured subjects' level of education. As depicted in Figure 5, the majority or subjects (86.3%) had attained a high school degree or equivalent, had two years of college, or had completed an associate's degree. For this variable, 6 people (0.8%) reported they had not completed high school, 277 people (37.4%) had completed high school or equivalent, 362 people (48.9%) had completed two years of college or an associate's degree, 63 people (8.5%) had completed a bachelor's degree, 25 people (3.4%) had some graduate work, and 7 people (0.9%) had completed a graduate degree. Twenty-two people (2.9% of the total sample) did not respond to this item.

The TOIS measured subjects' self-reported experience using computers as a demographic variable. As shown in Figure 6, subjects had a wide range of computer experience, though most considered themselves to have average or higher than average computer skills. Specifically, 38 people (5.1%) reported very low computer experience, 44 people (5.9%) had low experience, 130 people (17.4%) reported lower than average experience, 301 people (40.2%) had average experience, 136 people (18.2%) were higher than average, 61 people (8.1%) reported high experience, and 39 people (5.2%) reported very high computer experience. Thirteen people (1.7% of the total sample) did not

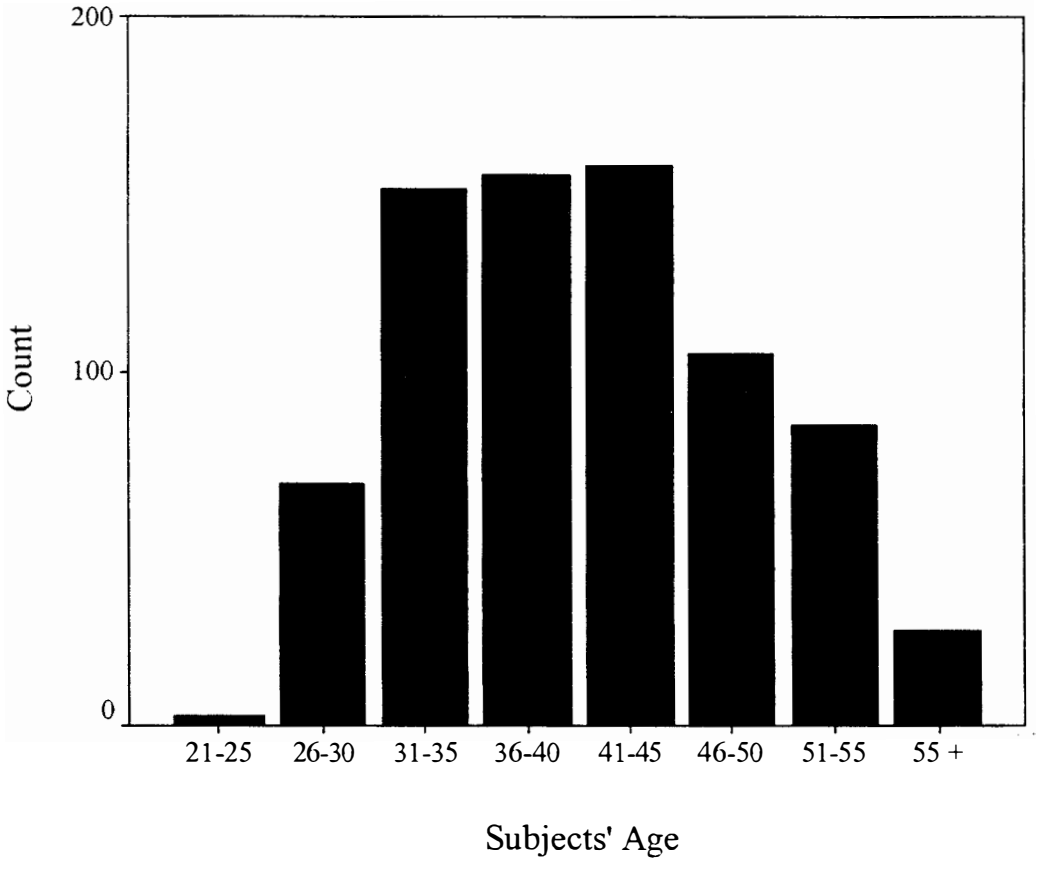

Figure 4
Histogram depicting subjects' age.

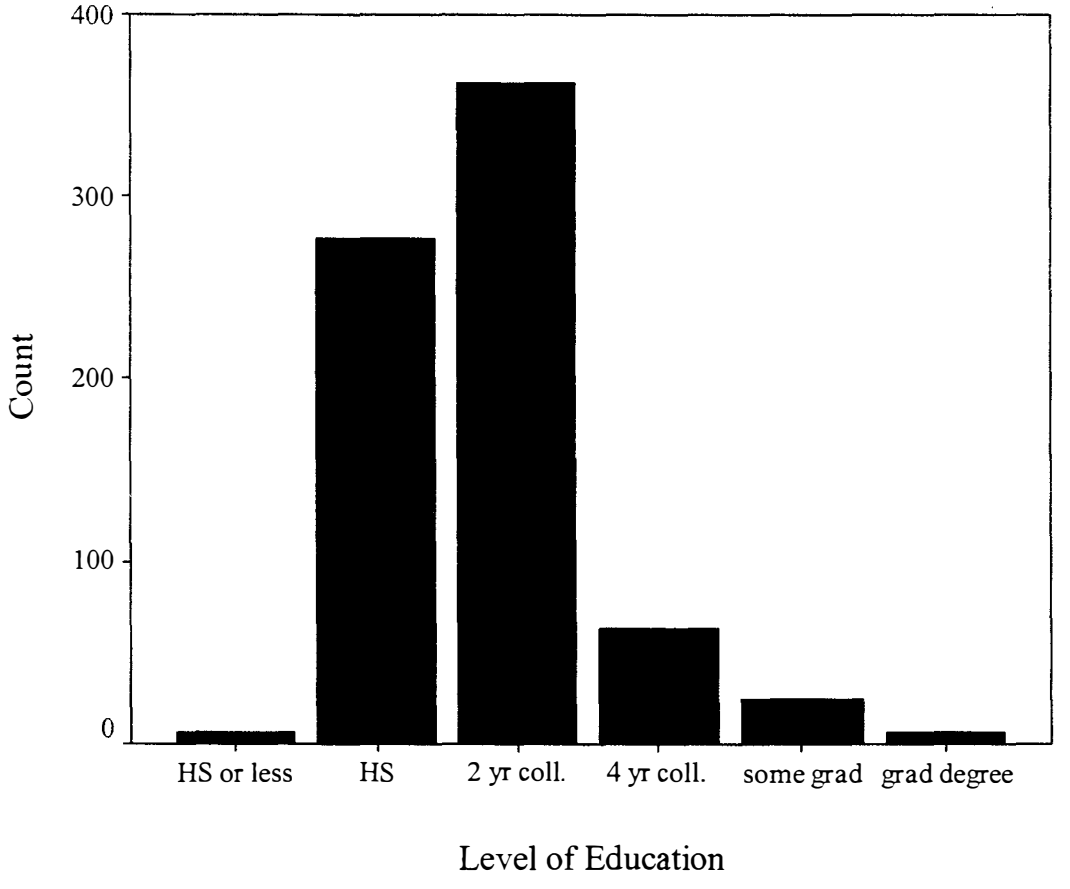

Figure 5
Histogram depicting subjects' level of education.

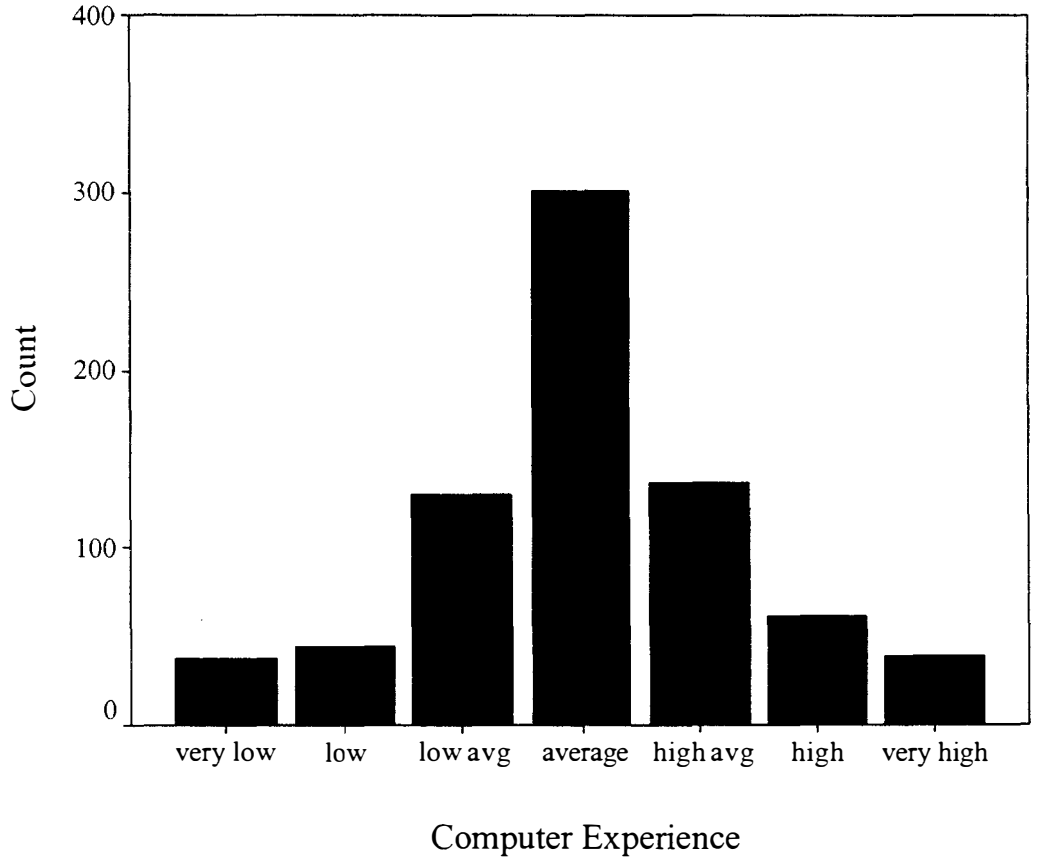

Figure 6
Histogram depicting subjects' computer experience.

respond to this item.

The next demographic variable assessed was reported experience with online instruction. As expected, responses on this item were in the lower ranges, as seen in Figure 7. A large portion of the sample, 70.7%, reported their experiences with online instruction were less than average. For this variable 213 people (28.4%) reported very low online instruction experience, 142 people (18.9%) had low experience, 176 people (23.4%) reported lower than average experience, 139 people (18.5%) had average experience, 49 people (6.5%) were higher than average, 19 people (2.5%) reported high experience, and 13 people (1.7%) reported very high instruction experience. Eleven people (1.4% of the total sample) did not respond to this item.

The final demographic variable assessed was experience with using the Internet. As shown in Figure 8, subjects had a wide range of Internet experience, though the majority of subjects (68.3%) scored in the middle three response choices, or the average ranges. Specifically, 54 people (7.2%) reported very low Internet experience, 49 people (6.5) had low experience, 136 people (18.1%) reported lower than average experience, 266 people (35.4%) had average experience, 111 people (14.8%) were higher than average, 70 people (9.3%) reported high experience, and 66 people (8.8%) reported very high computer experience. Ten people (1.3% of the total sample) did not respond to this item.

As stated previously, the primary research goals guiding this study were the development and statistical analysis of an assessment of online instruction self-efficacy. The next section addresses the first research question, which sought to develop a theoretical model of the factors for online instruction.

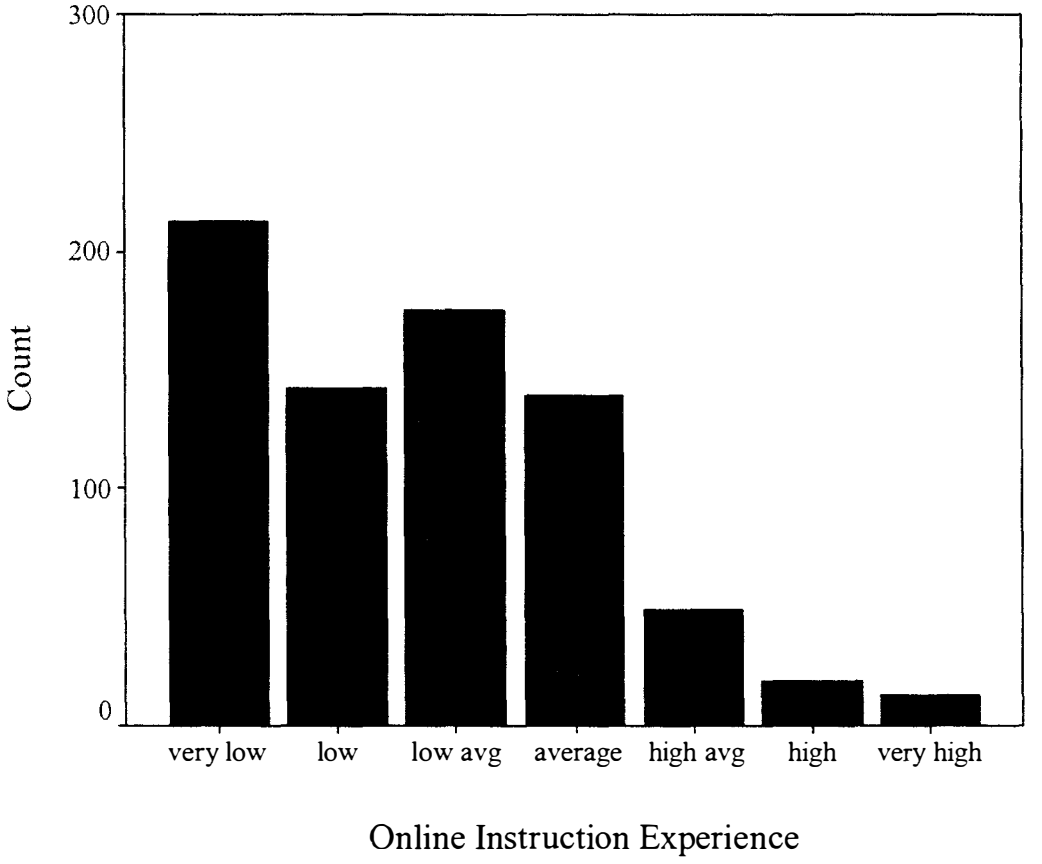

Figure 7
Histogram depicting subjects' online instruction experience.

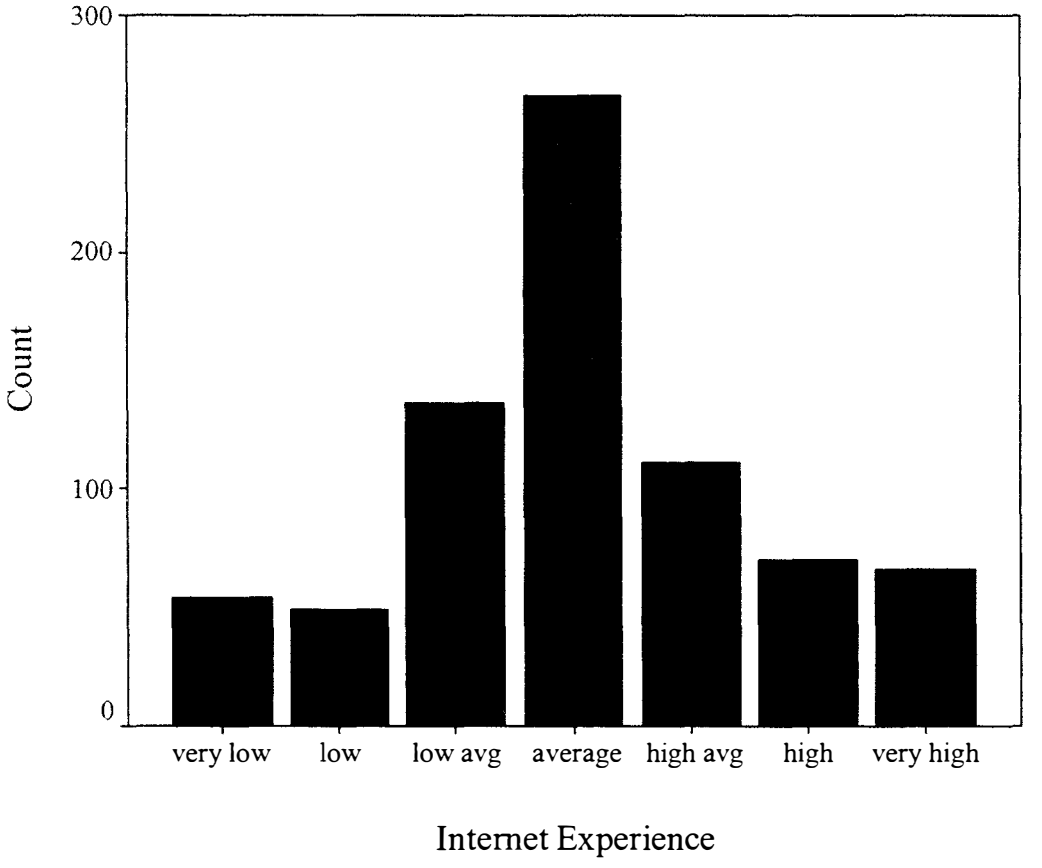

Figure 8
Histogram depicting subjects' Internet experience.

Research Question One: What are the Salient Factors of Online Instruction Self-Efficacy?

The study employed exploratory factor analysis procedures, as described in the methodology section in Chapter III, to answer the first research question. The factor analysis process for this study had four main steps: (a) assessing the fitness of the dataset for factor analysis procedures, (b) completing the initial factor analysis examination, (c) refining the final factor model, and (d) identifying and defining the underlying factor structure and theoretical model.

Fitness for factor analysis.

Determining the fitness of the dataset for factor analysis included several methods: (a) level of intercorrelation among variables, (b) reliability of variables, (c) sample size, and (d) two tests of fitness: Bartlett's test of sphericity and the Kaiser-Meyer-Olkin measure of sampling adequacy (Kaiser, 1974, 1981). Nunnally and Burnstein (1994) suggested that variables should have a moderate level of correlation with the other variables to make patterns easier to distinguish in factor analysis. Variables for this data set are moderately correlated, as seen in the full correlation matrix displayed in Appendix F, suggesting that the data set was acceptable.

Rummel (1970) suggested that most problems with factor analysis could be resolved by using a sufficient sample size, which should be greater than 300. That condition was satisfied with this sample. Tests of significance for fitness included the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy, which can range from zero to one. This sample yielded a KMO value of .974, which was considered more than acceptable according to standards set by Kaiser (1974). Bartlett's test of sphericity was

also used to analyze the appropriateness of factor analysis techniques, and was found to be statistically significant, $X^2 = 16{,}866$ ($df = 406$) = $p <= .000$.

Another measure of the fitness of the dataset for factor analysis procedures is the examination of Kaiser's Measurement of Sampling Accuracy (MSA) as described by Kaiser (1981). The MSA statistic is used to indicate whether the study included enough subjects based on the number of factors extracted and number of variables. Generally, an MSA of .50 or better is adequate. The MSA ratings for each variable in this dataset was greater than .90, as seen in the anti-image correlation matrix diagonals, presented in Appendix G. This dataset was fit for factor analysis procedures based on these tests and recommendations.

Initial factor analysis.

An initial factor analysis examination of the test data was completed using all 40 items from the final TOIS instrument, employing an orthogonal (Varimax) rotation and principal component factor extraction method, as described in factor analysis procedures discussed in Chapter III. Appendix H contains the rotated factor loadings, more technically described as factor pattern coefficients (Nunnally & Bernstein, 1994), and total variance explained in this initial examination.

The initial factorial examination resulted in a four-factor solution, using the default criterion of inclusion of all factors with an eigenvalue greater than one, a typical standard. Yet it could overestimate the number of meaningful factors (Nunnally and Bernstein, 1994). The four-factor solution presented several problems. First, an examination of the scree plot (Figure 9) of the eigenvalues indicated a three-factor structure was more appropriate than was a four-factor structure, since the plot began to

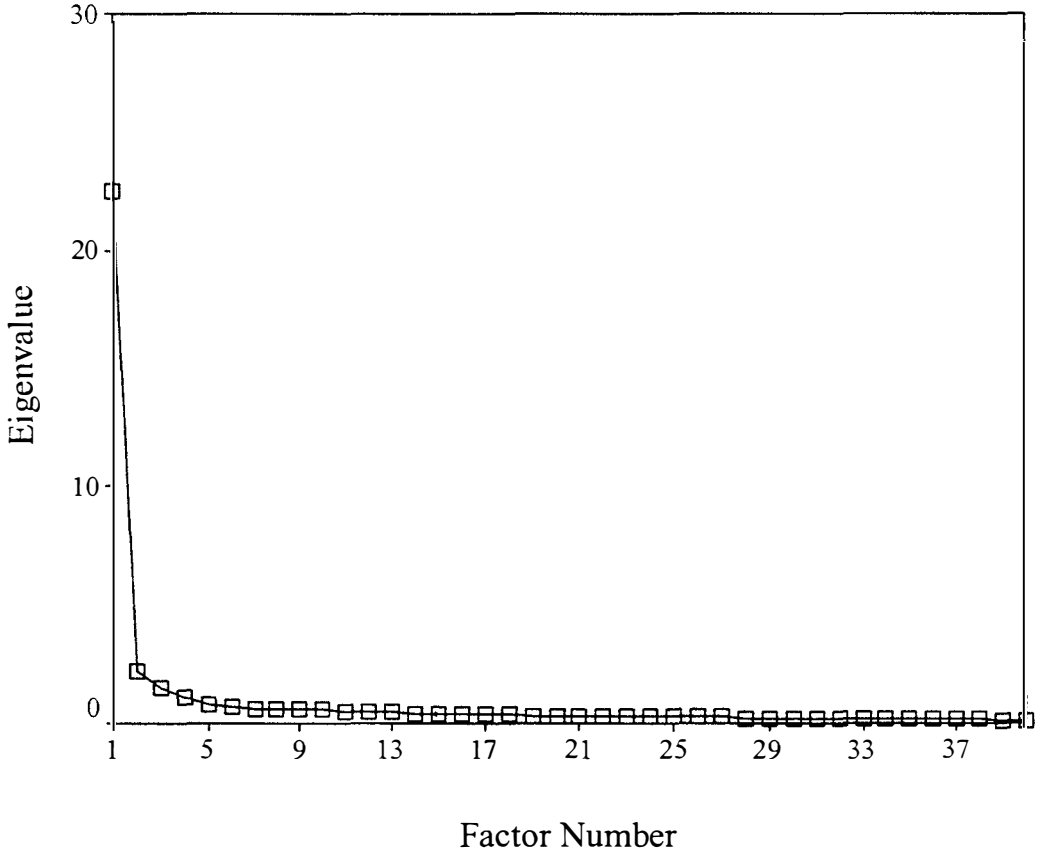

Figure 9
Scree plot for initial factor analysis examination (40 items).

flatten after the third factor. Additionally, the fourth factor was nearly excluded from the analysis due to its having an eigenvalue near 1 (1.079), which shows that the fourth factor was not explaining much in the data set. As further support that the initial model was not sufficient, the initial factor modeling process took 15 iterations, which is somewhat high, indicating the lack of fit of this model for the data.

In examining the meaningfulness of the factors, since the goal of exploratory analysis is to provide understanding of the underlying structure of the dataset, the fourth factor also posed problems. The items in the fourth factor did not lend themselves to a clearly interpretable relationship, and a three-factor structure seemed the most conceptually interpretable factor structure consistent with the data.

The next step of the model-fitting process was to remove unnecessary items to produce a better fitting model. A combination of removing the seven items that loaded highest on the fourth factor (items 17, 26, 32, 33, 38, 39, and 40), as well as excluding four items that did not make the established .50 loading cutoff rule (items 7, 15, 18, and 19) reduced the total number of survey items used for factor analysis from 40 to 29.

Final factor analysis and model.

The next step in the exploratory factor analysis process was to reexamine the reduced variable list (29 items instead of 40) for factor structure. Since the initial analysis had revealed a three-factor structure, it was not surprising that the secondary phase of factor analysis found three factors using the default criterion of inclusion of all factors with an eigenvalue greater than one, after the removal of the 11 non-useful items. Figure

10 shows the scree test results for the 29-item model, which also indicated that the three-factor solution was appropriate.

Table 5 shows the specific eigenvalues for the first five factors using the principal components extraction method. Table 5 also shows the initial variance explained for each of the four factors identified by the default criteria of eigenvalue > 1. Additionally, the table displays the percentage of variance accounted for by the individual factors after orthogonal rotation. The first factor explained 28.6 % of the variance in the sample data, while the second and third factors explained 22.8% and 17.1 % of the variance, respectively. In total, this three-factor model explained 68.7 % of the variance in the sample dataset.

Table 6 displays the rotated factor matrix for the 29 variables used for the secondary factor analysis procedure, along with their loadings. The table also presents the variables ordered by the primary factor on which they loaded. Appendix I provides the total loading for all variables on all factors, as well as the reproduced correlational matrix for this model.

Table 5
Eigenvalues: Total Variance Explained, First Five Factors

	Initial Eigenvalues			Rotated Sums of Squared Loadings		
Factor	Total	% of Variance	Cum. %	Total	% of Variance	Cum. %
1	16.553	57.078	57.078	8.312	28.663	28.663
2	1.927	6.644	63.722	6.637	22.887	51.550
3	1.451	5.005	68.727	4.981	17.176	68.727
4	.724	2.497	71.224			
5	.628	1.952	73.388			

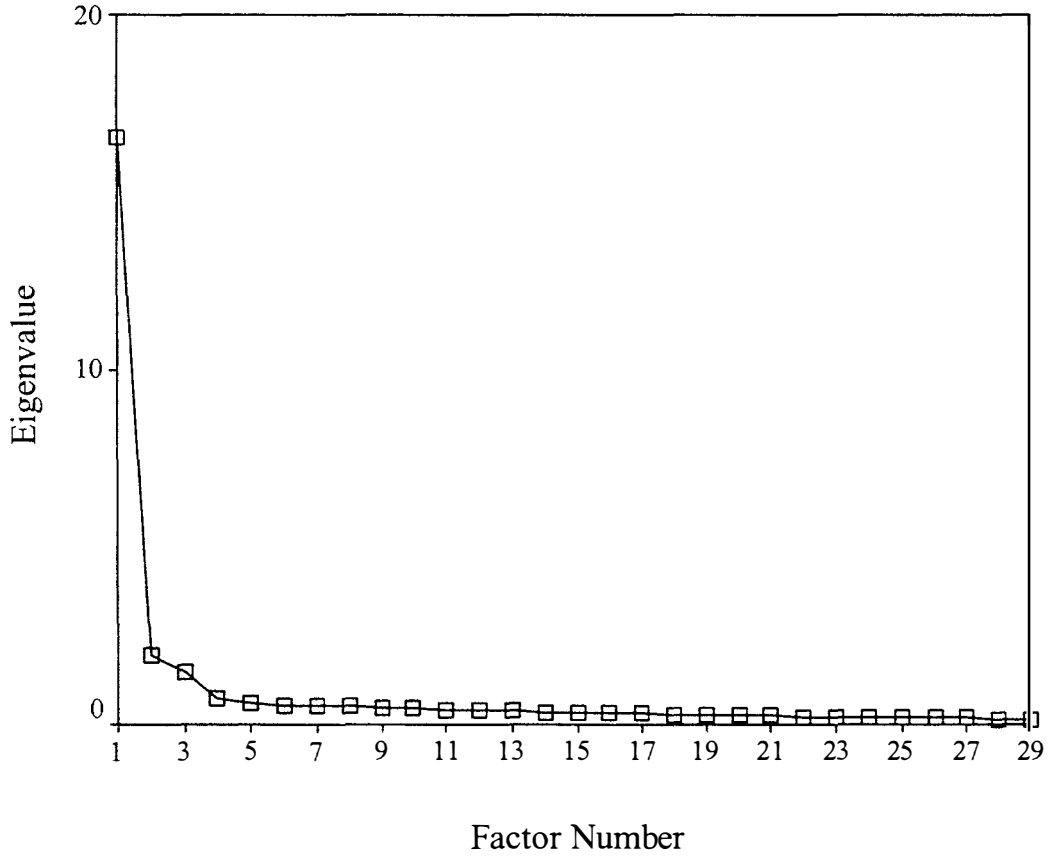

Figure 10
Scree plot for final factor analysis examination (29 items).

Table 6
Rotated Factor Matrix (Loadings by Factor) For Final Model

	Factor		
Item	1	2	3
6. Find my way (navigate) around websites	.793		
8. Use an Internet browser	.783		
10. View an attachment from an incoming email message	.785		
11. Use email to communicate effectively with other participants	.695		
12. Download and install software for my Internet browser that is needed for the course	.816		
14. Evaluate the quality of information found on a website	.536		
16. Follow standard online etiquette guidelines	.618		
20. Learn to use new software required for the course	.645		
21. Save a document from the Internet	.801		
25. Find information on a website that offered keyword search	.682		
27. Use email to communicate effectively with my instructor	.619		
36. Attach a file to an email message	.760		
37. Understand a concept from reviewing materials presented on several different websites	.629		
22. Address disagreements between course participants online	.518	.637	
23. Keep appointments to meet other participants online for scheduled events		.677	
24. Participate in a discussion group in which the topic is discussed over a period of time by leaving a message for participants		.660	
28. Participate in a live online discussion in which course participants discuss a topic at the same time		.693	
29. Organize and lead a course project involving other participants		.722	
31. Participate in group decision making		.751	
34. Develop a relationship with another course participant		.766	
35. Give constructive feedback to other course participants		.738	
30. Stay involved with the course without face-to-face interaction with the instructor		.594	.552
1. Complete a project with other course participants		.500	.518
2. Take an online test on course subject matter			.706
3. Stay involved with the course without face-to-face interaction with other course participants			.739
4. Work alone			.690
5. Learn from information presented in a video format			.739
9. Critique my instructor's performance in teaching the subject matter online			.547
13. Learn from the information presented in an audio format			.596

Table 7 shows the reliability test results for the reduced model with 29 items. The results indicate that reliability was not an issue for the final implementation dataset and the final factor analysis model was accepted as reliable.

In comparing the initial factor analysis results with the secondary analysis, the three-factor solution determined with the revised item list provided a simplified model that accounted for as much sample variance as did the initial four-factor structure. Additionally, the factor analysis rotation process took only seven iterations, compared to the 19 iterations of the initial four-factor solution, providing support that the three-factor structure was a better fit for this dataset. As further support of this model, the initial four-factor model accounted for 68.35% of the sample variance using all 40 items, whereas the subsequent three-factor model accounted for 68.73% variance using the remaining 29 after exclusion of 11 variables that loaded on the excluded fourth factor or had < .50 loadings. In total, these findings suggested that the revised model provided a better fitting, simpler model than did the initial factor analysis.

Table 7
Reliability Tests for the Final Factor Analysis Model

Item Grouping	Survey Items Included	Cronbach's Alpha
Factor 1	14 total items (Q6, 8, 10, 11, 12, 14, 16, 20, 21, 22, 25, 27, 36, 37)	Alpha = .964
Factor 2	10 total items (Q1, 22, 23, 24, 28, 29, 30, 31, 34, 35)	Alpha = .942
Factor 3	8 total items (Q1, 2, 3, 4, 5, 9, 13, 30)	Alpha = .895
Overall reliability test for final 29 item model:		Alpha = .973

Note. Underlined items cross-load onto more than one factor.

As an alternative method to make sure the derived three-factor model was the best fit for the data, the original 40 items were forced to three factors to see if such a model would provide a better fit compared with dropping items from the fourth original factor. In comparison, the model of all items forced to three factors explained less variance (65.6% compared to 68.7%), took more iterations (nine compared with seven), and used more items (38 compared with 29), than did the four-factor model. Additionally, the factor structure was less clear in interpretation. Based on this comparison, the derived 3-factor model was the best fit for this dataset.

Defining the final factor structure.

In defining the three factors uncovered in the final factor analysis procedure, the researcher used a causal naming process, as described by Rummel (1970). In using the causal type of factor names, the researcher attempted to choose names that explained the underlying influences that caused particular variables to load on a factor. Table 8 presents the definitions of the three factors identified in this study: Internet / technology behaviors, collaborative behaviors, and individual behaviors.

Table 6 and 7 identify three variables (items 1, 22, 30) that load on two factors at the defined minimum loading level, .50. Researchers have preferred that variables load only on one factor highly, and load much lower on other factors (Rencher, 1995). However, this is often not the case, which makes interpretation more difficult. The three items were retained for this study based on their strength and perceived logical relationship, even though researchers sometimes drop cross-loading items.

Two items, 1 and 30, loaded at > .50 on both the collaborative and the individual behaviors factors. Item one, which addressed completing a project with other course

Table 8
Names and Definitions of the Factors for the Derived Model

Factor Name	Factor Definition
Factor One: Internet / Technology Behaviors	Technological and Internet skills used in online instruction; it covers issues including downloading and installing browser software, saving and sending documents, navigating websites and using Internet browsers, and using email for a variety of tasks.
Factor Two: Collaborative Behaviors	Working with others in an online environment; it covers issues such as developing relationship with other course participants, participating in group decision making online, giving feedback to others, organizing and completing group projects, and participating in asynchronous and synchronous group communications.
Factor Three: Individual Behaviors	Activities that tend to be solitary and require the individual to work alone in online instruction; it covers issues including participating without face-to-face interaction with other students or the instructor, learning from information in video and audio formats, taking online exams, and working alone.

participants, is logically supported as impacting both factors since group project typically include both an individual component to the assignment as well as requires the participant to interact and coordinate the project with other peers. Similarly, item 30, which assessed participants' ability to stay involved with the course without face-to-face interaction with the instructor, could contain elements of both individual and collaborative behaviors. It has a component of interacting with others, the instructor in this case. The absence of that interaction is related to the individual behaviors factors. Item 22, addressing disagreements between course participants online, cross-loaded on both the Internet / technology and collaborative behaviors factors. This also is logically supported, since the Internet / technology factor was a major indicator of self-efficacy in this study. Possibly subjects were considering not only the collaborative nature of addressing disagreements with a peer, but also how the technology would impact the task since face-to-face contact is limited.

In summary, to answer the first research question, which sought to identify the salient factors of online instruction self-efficacy, a two-stage factor analysis procedure produced a three-factor model. This three-factor model accounted for much of the variance found in the dataset (68.7 %) and identified three relatively equal factors for describing online learning self-efficacy:

1. A 14-item factor related to the Internet and to technological behaviors involved in participating in online instruction (explaining 28.6 % of the variance),

2. A 10-item factor characterized by collaborative behaviors related to online instruction (explaining 22.8% of the variance), and

3. An 8-item factor related to individual behaviors for online instruction self-efficacy (explaining 17.1 % of the variance).

This three-factor model was used in subsequent analyses to address the remaining research question on the sample demographic variables and the six related research hypotheses.

Research Question Two: Do Self-Efficacy Beliefs Change Significantly for the Sample's Demographic Variables?

To answer the second research question, two Multiple Analysis of Variance (MANOVA) tests were completed, since the study contained multiple dependent variables (three factors consisting of a total of 29 items). MANOVA tests allow not only for multiple dependent variables but also provide a more powerful test of significance for a large sample, and reduce error rates relative to those that occur in a series of univariate ANOVAs (Diekhoff, 1992). For this study, the MANOVA tests examined only main effects and did not test interaction effects between demographic variables. The first MANOVA test examined the gender, age, and level of education of NJATC electrician instructors for effect with the three identified factors. The second MANOVA tested the extent of computer experience, experience with online instruction, and extent of Internet experience for subjects in relation to the three identified factors. The study employed Tukey-Kramer's post-hoc tests when the individual tests were significant. The Tukey-Kramer post-hoc test on mean differences is similar to the Tukey Honestly Significant Different (HSD) test, but is theorized to better accommodate unequal sample sizes (Kramer, 1956). The post-hoc comparisons report relationships among group levels for the independent variables (demographic variables) compared to the three factors (dependent variables). Appendix J presents the actual mean scores for each demographic variable. Each test is reported in order of research hypothesis addressed.

H_o1: *There will be no significance difference in online instruction self-efficacy beliefs regarding gender as measured by the survey instrument among subjects.*

To test this research hypothesis, the MANOVA overall test was examined. The MANOVA test (Wilks' Lambda = .441, $F(3, 723) = .899, p = .441$) did not suggest significant differences existed between female and males in response to the three factors. As previously noted, the number of female subjects was only 31 (4.1%) and was not a very reliable distinction for the purposes of this study.

H_o2: *There will be no significance difference in online instruction self-efficacy beliefs regarding age as measured by the survey instrument among subjects.*

The overall MANOVA test (Wilks' Lambda = .955, $F(21, 2077) = 1.594, p = .042$) suggested that significant differences existed between the different age groups of subjects in response to the three factors. However, the individual ANOVA tests for age did not support that there was a difference, as shown in Table 9. The hypothesis was not rejected that different age groups scored differently for the three factors. A cursory examination of the post-hoc test revealed that the youngest group (age 20 or younger) could have been somewhat different from the other age groups for the Internet / technology behaviors factor and for the individual behaviors factor. That group was not different from the other age groups for the collaborative behaviors factor. However, since

Table 9
Univariate ANOVA Test for Age

Dependent Variable	Type III Sum of Squares	df	*F*	Significance
Internet / Technology Behaviors	15.009	7	1.322	.237
Collaborative Behaviors	7.641	7	.764	.618
Individual Behaviors	5.303	7	.613	.746

only three subjects were ages 20 or younger, this data did not seem very reliable.

H_o3: *There will be no significance difference in online instruction self-efficacy beliefs regarding educational achievement as measured by the survey instrument among subjects.*

In examining the effect of educational achievement upon factor scores, the overall MANOVA test (Wilks' Lambda = .967, $F(15, 1996) = 1.633$, $p = .058$) revealed that there was no significant difference between levels of education for the three factors. A cursory examination revealed that the data mean scores for the subjects that had not completed high school (n=6) possibly was influencing the data.

H_o4: *There will be no significance difference in online instruction self-efficacy beliefs regarding extent of computer experience as measured by the survey instrument among subjects.*

Table 10 shows the MANOVA test (Wilks' Lambda = .886, $F(18, 2056) = 4.985$, $p < .001$), which indicated significant differences existed between levels of response for extent of computer experience and responses to the three factors. The individual ANOVA test for extent of computer experience also indicated some differences existed in the levels of computer experience compared to underlying online instruction self-efficacy factors. For extent of computer experience, the levels of responses were different for the Internet/technology behaviors factor and for the individual behaviors factor but not for the collaborative behaviors factor. Table 11 presents the results of the Tukey-Kramer

Table 10
Univariate ANOVA Test for Extent of Computer Experience

Dependent Variable	Type III Sum of Squares	df	*F*	Significance
Internet / Technology Behaviors	42.353	6	8.839	<.001
Collaborative Behaviors	12.197	6	1.904	.078
Individual Behaviors	20.188	6	3.359	.003

post-hoc test. The table shows differences among levels of computer experience for the significant factors. For all post-hoc tests, the means scores for the sample data conveniently followed the Likert scale order from lowest to highest. For example, the lowest mean score for the sample data corresponded to the "low" computer experience response, while the highest mean score corresponded to the "very high" computer experience response. A common underline connects groups for which the Tukey-Kramer test did not detect any significant differences based on mean score. Table 11 shows that mean scores for both the Internet/technology behaviors factor and the individual behaviors factor were significantly higher as level of reported computer experience increased. For the Internet / technology behaviors factor, nearly every level had a

Table 11
Tukey-Kramer Post-Hoc Comparison of Mean Scores for Extent of Computer Experience Groups on Two Factors

TOIS Factor	Extent of Computer Experience						
	Very Low	Low	Lower Than Avg.	Avg.	Higher Than Avg.	High	Very High
Internet / Technology Behaviors							
Individual Behaviors							

significantly different mean from the other groups. The individual behaviors factor was not as discrete, however the lowest response means were significantly different from the highest response means.

H_o5: *There will be no significance difference in online instruction self-efficacy beliefs regarding extent of online instruction learning experiences as measured by the survey instrument among subjects.*

In testing this research hypothesis, the MANOVA overall test (Wilks' Lambda = .944, $F(18, 2056) = 2.350$, $p = .001$) suggested significant differences existed in the scores for the different levels of online instruction experience on the established online instruction self-efficacy factors. The individual ANOVA test for extent of online instruction experience, shown in Table 12, indicated some differences existed in the scores for self-efficacy factors for the different levels of online instruction experience seen in the sample data. The ANOVA revealed that for extent of online instruction experience, the levels of responses were different for the collaborative behaviors factor but not for the Internet/technology behaviors factor or for the individual behaviors factor. Table 13 shows the Tukey-Kramer post-hoc test results, which indicated that mean scores for the collaborative behaviors factor were significantly higher as the level of reported online instruction experience increased.

Table 12
Univariate ANOVA Test for Extent of Online Instruction Experience

Dependent Variable	Type III Sum of Squares	df	*F*	Significance
Internet / Technology Behaviors	3.677	6	.767	.596
Collaborative Behaviors	20.248	6	3.160	.005
Individual Behaviors	9.397	6	1.564	.155

Table 13
Tukey-Kramer Post-Hoc Comparison of Mean Scores for Extent of Online Instruction Experience Groups on One Factor

TOIS Factor	Extent of Online Instruction Experience						
	Very Low	Low	Lower Than Avg.	Avg.	Higher Than Avg.	High	Very High
Collaborative Behaviors	———	———	———				
		———	———	———			
			———	———	———		
				———	———	———	
					———	———	———

H_o6: *There will be no significance difference in online instruction self-efficacy beliefs regarding extent of Internet experience as measured by the survey instrument among subjects.*

In testing the effect of Internet experience by factor structure, the overall MANOVA test (Wilks' Lambda = .881, $F(18, 2056) = 5.251$, $p = < .001$) suggested significant differences existed in the scores for the different levels of Internet experience on the online instruction self-efficacy factors. Table 14 shows the individual ANOVA test for extent of Internet experience, which indicated that differences existed in the scores for two of the self-efficacy factors for the different levels of Internet experience reported by subjects.

The ANOVA revealed that for extent of Internet experience, the levels of responses were different for the Internet/technology behaviors factor and for the collaborative behaviors factor, but not for the individual behaviors factor. Table 15 presents the Tukey-Kramer post-hoc test results, which indicated that mean scores for both the Internet/technology behaviors and collaborative behaviors factors were

Table 14

Univariate ANOVA Test for Extent of Internet Experience

Dependent Variable	Type III Sum of Squares	df	*F*	Significance
Internet / Technology Behaviors	53.839	6	11.236	<.001
Collaborative Behaviors	22.798	6	3.558	.002
Individual Behaviors	10.478	6	1.744	.108

Table 15

Tukey-Kramer Post-Hoc Comparison of Mean Scores for Extent of Internet Experience Groups on Two Factors

TOIS Factor	Extent of Internet Experience						
	Very Low	Low	Lower Than Avg.	Avg.	Higher Than Avg.	High	Very High
Internet / Technology Behaviors							
Collaborative Behaviors							

significantly higher as the level of reported Internet experience increased.

Summary of Findings

Findings for this study included two sections: the findings for the analysis of the pilot study data and the final sample data analysis. The findings of the final sample data included three sections: (a) descriptive statistics, (b) the exploratory factor analysis results used to answer the first research question regarding identifying the salient factors of online instruction self-efficacy, and (c) the MANOVA and post-hoc test results used to answer the second research question focusing on the significance of the demographic variables assessed in the survey in relation to online instruction self-efficacy.

Pilot Instrument

College students and adults involved with professional development served as a pilot group in the second phase of pilot study for this research. The purpose was to assess internal consistency and reliability. Reliability coefficients for the pilot were computed for perceived groupings of items according to topic, as well as for all 40 items. The high internal reliability coefficients found justified acceptance of the survey as the final form of the TOIS instrument.

Final Sample Data

The findings for the final data sample included descriptive statistics for the 40 survey items and the 6 demographic variables. Additionally, findings were reported for each research question and hypothesis established for this study.

Descriptive statistics.

The descriptive statistics reported for the final data included individual item results for the survey instrument. Item means revealed that average self-efficacy beliefs

for all 40 items on the survey were between "sometimes" and "almost always". The demographic variables revealed that the sample of NJATC electrician instructors in the study were mostly middle-aged males. Most subjects had completed high school and many had at least two years of post-secondary education. In reporting their experiences, subjects reported having mostly average experience with computers, little experience with online instruction, and a wide range of Internet experience.

Exploratory factor analysis findings.

This study employed exploratory factor analysis procedures to address the first research question: What are the salient factors of online instruction self-efficacy? Based on the first step in the exploratory factor analysis process, assessing the fitness of the data for factor analysis, the data was acceptable for factor analysis based on intercorrelation among variables, reliability, sample size, and three statistical measures of data adequacy. Other results of the exploratory factor analysis process included:

1. The initial factor analysis procedure suggested the elimination of 11 items from the initial 40-item survey, which allowed the reduced 29-item model to account for the same amount of variance seen in the sample data, but used less items and fewer factors, and provided a better model of the data.

2. The final factor analysis procedure used a principal component extraction method with orthogonal rotation and resulted in a three-factor solution that accounted for 68.7% of the variance seen in the sample data.

3. The variables that loaded at the .5 level on the three factors were similar enough to allow definition of the factors, which included an Internet / technology behaviors factor, a collaborative behaviors factor, and an individual behaviors factor. These factors were defined further in Table 8.

Demographic analyses.

The study employed demographic procedures to answer the second research question: Do the self-efficacy beliefs of instructors change significantly for the

demographic variables of gender, age, educational achievement, age, extent of computer experience, extent of personal online instruction learning experiences, and extent of Internet experiences for the sample data?

1. Subjects' online instruction self-efficacy beliefs were not significantly different regarding gender as measured by the TOIS instrument.

2. Subjects' online instruction self-efficacy beliefs were not significantly different regarding age as measured by the TOIS instrument.

3. Subjects' online instruction self-efficacy beliefs were not significantly different regarding level of educational attainment as measured by the TOIS instrument.

4. Level of computer experience was significant for online instruction self-efficacy beliefs. Subjects with less computer experience had significantly lower self-efficacy beliefs compared to subjects with more computer experience. This effect was found for only the Internet / technology behaviors and individual behaviors factors.

5. Self-efficacy beliefs on the collaborative behaviors factor were significantly lower for subjects with little online instruction experience compared to subjects with more experience.

6. Subjects with low Internet experience had lower self-efficacy scores on both the Internet / technology behaviors and on the collaborative behaviors factors compared to subjects with higher levels of Internet experience.

CHAPTER V

Conclusions, Implications, and Recommendations

The primary objectives set for this study were to examine the variable relationships of the TOIS through the use of exploratory factor analysis procedures and to develop a model of the underlying characteristics of online instruction self-efficacy. The TOIS was developed based on a review of the literature and expert review. Subject matter experts in the areas of online instruction and self-efficacy reviewed the TOIS for face validity. After revision of the TOIS, pilot testing revealed internal consistency and reliability. In the final testing of the instrument, exploratory factor analysis procedures exposed the salient characteristics of online instruction self-efficacy, based on sample data collected from the electrician instructor population attending the NJATC National Training Institute in August 2001. An additional goal for this study was to determine the relationship of the sample's demographic variables to their online instruction self-efficacy beliefs. This section details conclusions, implications and recommendations based on this study.

Conclusions

This chapter presents conclusions for this study in several sections, including: (a) conclusions based on the findings of the study, (b) possible alternative hypotheses for results found, (c) impact of the study, and (d) strengths, weaknesses and limitations of the findings.

Conclusions Based on the Findings of the Study

The findings of the final TOIS testing included two main divisions: (a) exploratory factor analysis results used to answer the first research question regarding

identifying a factor model of online instruction self-efficacy, and (b) the MANOVA and post-hoc test results used to answer the second research question addressing the significance of the demographic variables to online instruction self-efficacy. Conclusions based on these findings are offered for each research question established at the onset of this study.

Research question one: What are the salient factors of online instruction self-efficacy?

For this study and sample, the TOIS adequately and successfully measured the psychological construct of self-efficacy beliefs related to the domain of online instruction. The factor model of online instruction self-efficacy reported in this study fit the data well, accounted for a large portion of the variance, and was logically interpretable. The three factors found in this study make logical sense in relation to the components of online instruction.

It is not surprising to have found an Internet/technology behaviors theme in this research. The domain of online instruction includes not only the tasks typical of any instructional experience but also requires the participant to complete many of these tasks using a tool, the computer, to mediate the distance between the participant and the instructor, and the distance between the participant and other peers. Skill for online instruction cannot be equated skill for using the computer. Instead, the computer and the Internet must be seen as a technology used to facilitate the instructional experience, analogous to the use of a telephone to facilitate conversation. A conversation between two people standing face-to-face is different from the same conversation being conducted through a telephone, a technological device designed to mediate the distance between two

speakers. The difference is that one cannot view the facial expressions, hand gestures, or other minute visual details of the conversational process. However, a person must have the skills of using a phone to participate in the conversation. It is logical that computer, technology, and Internet skills are important to people participating in online instruction and of special concern to people who feel their ability to use the tools are limited. This hypothesis is support by the findings of this research. To take the analogy further, in some situations basic skill in communicating using the telephone is not enough. Skills in using the telephone for conference calling allow communication with many people at the same time. Similarly, new computer and Internet browser skills may be needed to use the computer for synchronous communication.

In addition to the Internet/technology behaviors factor, which was supported by the literature (Harasim, 1990; Khan, 1997), two other factors emerged. Analysis also produced collaborative behaviors and individual behaviors factors. Findings from several studies supported the collaborative behaviors factor for online instruction self-efficacy found in this study (Harasim, 1990; Jiang, 1998; Khan, 1997; McInerney & McInerney, 1998; Palloff & Pratt 1999). Unless an instructional experience is truly self-directed, that is, planned, initiated and completed without outside assistance, some collaboration is involved if just with the instructor or leader. As mentioned previously, in online instruction experiences collaboration may require specific technological tools. Outside of the ability to use the technologies to achieve online collaboration, there are some aspects of collaboration that may be underlying the theme found in this study. Just as the persons involved a telephone conversation are missing visual cues due to changing the process from face-to-face to communication at a distance, it is likely that that the collaboration

process from a distance is altered compared to face-to-face collaboration. Self-efficacy judgments regarding collaborative behaviors found in this study may have been directed at either the tools used for collaboration or at the inherent issues related to collaborating at a distance. That is an issue for further study.

While depending on the curriculum content, it is fair to say that much of the work in typical instructional experiences at least has an individual component, even in collaborative projects. Rarely does a person collaborate without having an individual responsibility. The third factor identified in this study, individual behaviors, reflects this idea. The items that correlated with this factor focused on the solitary aspects of participating in online instruction. It is interesting that this factor did not include elements of self-regulation or self-directedness as was suggested by the literature. In fact, items written specifically to address self-directedness and self-regulation in the learning process did not show up at all in any factor. This issue is addressed further in the recommendations section of this chapter.

Research question two: Do self-efficacy beliefs change significantly for the sample's demographic variables?

Several of the demographic factors assessed were important, while others did not play a role in online instruction self-efficacy beliefs. While age and gender were not significantly related to self-efficacy for this sample, these demographics are problematic due to the sample used. The low number of female electrician instructors in the sample does not provide adequate comparisons by gender. Similarly, results found with regards to the age demographic cannot be used to rule out an effect of age on self-efficacy belief due to the homogeneous population used. While level of educational achievement was

not significant, the degree of uniformity of this population may have masked any effect on online instruction self-efficacy. It is quite possible that level of educational attainment does play a role in self-efficacy beliefs. That will have to be identified in further studies with populations that have a wider range of educational experiences.

Subjects' reported prior experiences with computers, online instruction, and using the Internet were significantly related to at least one of the three identified factors. The literature reviewed in this study provided support for the relationships of these experiences to self-efficacy beliefs. As expected, higher levels of experience with the tools and methods of online instruction correlated with higher levels of self-efficacy. According to self-efficacy theory, mastery experiences can positively affect self-efficacy (Bandura, 1997). This study provides support for this relationship.

Levels of online instruction experience generally were low for this sample. However, the overall means for the TOIS items indicated that many subjects felt they could complete the assessed online instruction tasks without extensive prior experience with online instruction. The literature supports several possible explanations for this finding. While not having a great deal of previous mastery experiences with online instruction, the strength of subjects' self-efficacy belief may have been related to generalization of learning ability.

As proposed by Bandura (1997), it is possible that one could generalize the ability to learn. For example, participants may have reflected on their ability to take a test in a traditional class and may have determined the online instruction format did not really effect their test-taking ability. Hence their previous experience with online instruction did not relate to that Internet / technology variable. Alternatively, it may be more appropriate

to think of the ability to learn as being a primary ability that is generalizable to many types of learning. Instead of generalizing from learning task to learning task (e.g., "I know how to drive a car. Therefore I can learn to drive a truck"), it may be that a complex interaction of experiences, beliefs, and personal factors, allows a person to gauge his or her ability to learn based on the particular domain (e.g., "I can learn to drive a car; and I can learn to drive a truck, since they are closely related and because I have a high belief in my ability to learn manual tasks requiring a high degree of body-eye coordination"). Similarly, subjects' self-efficacy beliefs may be unaffected by the domain of online instruction if they perceived the characteristics of the specific task to not be altered by the online format.

Subjects with lower scores for online instruction experience scored lower on collaborative items compared with subjects who had more online instruction experience. It is possible that the subjects perceived a difference in characteristics for online instruction collaborative tasks compared to face-to-face collaboration. The reader might conclude that subjects who did not have much experience with online instruction were unsure of how they would interact with peers in an online course.

For this sample, more experience with the Internet was related to higher self-efficacy beliefs for survey items relating to the Internet, which is quite logical and follows Bandura's (1997) conceptualization of the importance of mastery experiences. This interpretation also applies to the relationship seen between computer experience and the Internet/technology factor. It does add to the validity of the study that the data supports these theoretical relationships, as well as contributes to the interpretation of the hypothetical construct proposed.

Alternative Explanations for the Findings

With exploratory factor analysis, the researcher must be concerned with spurious results. It is possible for chance to be responsible for the factor structure uncovered (Nunnally & Bernstein, 1994) and for the postulations of factor interpretation to be figments of the researcher's mind. Additionally, the factor extraction method used for exploratory factor analysis involves a degree of subjectivity, such as the inspection of scree plots. Even with these chances for error, the three-factor solution found in this study appears robust based on the variance explained, the salient variables identified and the strength of their loadings. However, it is necessary to replicate the factors found in this study with other populations to be sure of the validity of the underlying theoretical structure of online instruction self-efficacy.

Strengths, Weaknesses, and Limitations of the Study

While this study was a comprehensive research endeavor, and some aspects of this research were robust, other areas need further refinement. An examination of the methodological and testing phases identified several strengths and weaknesses. The study also had several limitations to its usefulness.

Strengths.

Strengths of this study included the theoretical basis for the study, the size of the final test population, the high survey return rate, and the robustness of the findings. Additionally, the two-phase pilot-testing procedure strengthened the validity and reliability of the TOIS instrument. The study also had the following specific strengths:

1. The exploratory factor analysis methods used were appropriate for the objectives and goals of this study.

2. The large sample size for this study allowed for a reliable analysis of online instruction self-efficacy beliefs.

3. The underlying factor analysis model, resulting in three main factors of online instruction self-efficacy beliefs, was a good fit for the data and seemed to have reasonable explanatory power.

4. A survey instrument was developed that appeared to measure the psychological construct of online instruction self-efficacy.

5. The findings for the study were robust. This is bolstered by the fact that the dataset contained obvious cases in which the responses seemed suspect or possibly were completed with little attention. However, all data was included without deletions or changes to avoid researcher bias.

6. With the exception of a self-regulation/self-directedness factor, the findings supported the components explored in the literature review and proposed in the theoretical framework for this study. While the compartmentalization of some items was not as expected, the underlying structure found was interpretable.

Weaknesses.

Weaknesses of this study included the homogeneity of the surveyed population, as well as the use of a single population in testing the TOIS. While the study employed a non-probability sampling method, the high survey return rate aided inference back to the population studied. Several other specific weaknesses were also present in this study:

1. A major weakness of this study is the use of a single population. Replication with other populations is necessary to validate the findings of this study, the usefulness of the TOIS, and the predictive usefulness of the underlying factor structure found.

2. In this study, face validity only was assessed. Other measures of reliability such as criterion-related validity and construct validity are important in verifying the usefulness of a survey (Isaac & Michael, 1995).

3. This study used only exploratory factor analysis procedures. The use of confirmatory factor analysis procedures with other datasets may help establish the validity of the three-factor structure found in this study.

4. The TOIS included no negatively worded items. It is possible that subjects developed a response set to the positively worded statements contained in the survey instrument. Unfortunately, assessing self-efficacy beliefs does not easily accommodate negatively worded items since the basic concept is to inquire about the subject's belief in his or her ability to do something. It is uncommon to assess the subject's belief in his or her ability to not do something, or to do something that is clearly improper. It may be possible to use level of difficulty of domain activities as a method of reducing response set. Recording a low self-efficacy belief for a difficult domain activity after scoring high on an easy task could reduce response bias without the use of negative items.

5. It is possible that characteristics unique to the group studies resulted in findings that would not be important to other groups. For example, it can be hypothesized that the electrician instructor subjects of this study may have less experience in using "chat rooms" as compared to a younger population. Such a difference in experience could change subjects' views of using synchronous communication Internet tools to collaborate with peers.

6. This study included an older age group than some people involved with online instruction, such as entering college freshmen. It seems likely that self-efficacy beliefs related to learning could vary based on age. This study did find some possible differences based on age. However, these were limited due to the few younger participants in the study group.

Limitations.

Limitations of this study included the use of self-assessment procedures, as well as the non-probability sampling method employed. Additionally, the exploratory nature of this study precluded construct or criterion-related validity examinations. The study also had the following specific limitations:

1. This study did not develop a survey instrument to provide highly specific information regarding online instruction self-efficacy or to remedy incidents of low self-efficacy beliefs.

2. The study did not examine subject preparedness for or actual ability to participate in online instruction. Therefore no comparison between actual ability and perceived ability could be examined, which would have been a form of criterion-related validity.

3. The testing of the TOIS instrument did not include an examination of construct validity, or compare the construct or instrument to other concepts and theories that could impact online instruction self-efficacy.

4. The study used a non-probability sampling method. Generalizations made regarding these findings are limited until validated with other groups.

Implications

This study and its findings are applicable to other areas of research and practice in the areas of online instruction, self-efficacy research, and distance education. This section discusses the implications of this study to professional practice and decision-making, as well as to scholarly understanding and theory building.

Implications for Professional Practice and Decision-Making

The findings of this study hold implications to a variety of people involved with current educational practice including distance education professors, curriculum designers, and corporate trainers, as well as for educational and training decision-makers. As reported in the review of literature, previous experience has been an important part of self-efficacy beliefs (Bandura, 1997). This study provides evidence that people with little computer experience had lower self-efficacy for completing online instruction tasks that rely on computer and Internet skills. Not as easily prognosticated is the implication that inexperience with online instruction was related to lower self-efficacy beliefs for collaborative behaviors. In planning for the use of online instruction methodologies, a decision-maker may want to build in supplement methods of reinforcing collaborative relationships for those new to online instruction. Additionally, increased training on using the Internet before engaging in online instruction may help participants increase their

self-efficacy to complete tasks covered in Internet/ technology behaviors and in collaborative behaviors factors.

Implications for Scholarly Understanding and Theory Building

This research added to the body of knowledge for both online instruction and self-efficacy research. To better prepare and implement online instruction programs, it is necessary to assess learners' attitudes and beliefs related to using the new technologies in online educational practice. This study helped fill this void and provided a framework for understanding the important characteristics of self-efficacy beliefs involved with online instruction.

The lack of a self-regulation factor in this study has implications for theory building in self-efficacy research. The survey attempted to assess both self-regulation and self-directedness with items such as "prioritize my own course activity workload", "keep myself on task", "give myself enough time to complete assignments", and "plan and manage my own learning needs". The absence of these items in the final factor model is perplexing. Their exclusion could be related to the fact that these items are less concrete than most of the other items in the survey. It is also possible that the items used do not properly reflect self-direction and self-regulation skills that are needed for the online instruction process. Another alternative hypothesis for not finding a self-regulation factor is the age of the participants in this study. It is feasible that the absence of self-regulation and self-directedness occurs in younger students compared to students who have more experience with the learning process. If this hypothesis is correct, it would not be surprising that this factor did not appear in this study since few subjects were in the lower age ranges. What is clear is that the understanding of the role of self-direction and self-

regulation in the domain of online instruction and self-efficacy theory needed further refinement.

Recommendations

This research examining the factor relationships between variables measuring online instruction self-efficacy was exploratory. Several recommendations for future research are offered:

1. While the factor model derived fit this dataset well, assessment of online instruction self-efficacy with other populations is necessary to determine the degree to which the results of this study can be generalized.

2. Online instruction self-efficacy should be assessed with potential learners that have more equitable numbers of females compared to males before any gender differences can be excluded.

3. Conducting this type of research with groups having a greater range in ages, or at least with different ages is necessary to determine how self-efficacy beliefs for online instruction relate to age. Since self-efficacy is partially related to mastery experiences, it is hypothesized that age could play a role in the strength of self-efficacy beliefs.

4. Future studies should examine populations with other ranges of educational attainment. It is possible, and supported in this research, that people with low levels of education would have lower levels of self-efficacy for participating in online instruction. Further research is necessary.

5. Further study is required to better understand the collaborative factor structure found in this study. It would be interesting to determine the relative importance of being able to use the tools required for collaboration at a distance, compared with self-efficacy beliefs related to the inherent issues of collaborating at a distance. Qualities of collaborating at a distance, such as relationship-building factors, loss of nonverbal cues, and peer motivation could be important to excelling in online instructional experiences that require a high degree of distance collaboration.

6. Future research should examine the relationship of online instruction self-efficacy beliefs to actual performance of online instruction tasks. Such research could add to the validity of the online instruction self-efficacy construct, as well as possibly provide support to social cognitive theory.

7. The relationship of self-directed and self-regulation to the domain of online instruction and the theory of self-efficacy remains unclear. This relationship needs further definition, since it is quite likely that these areas do impact the learning experience and do play a significant role in online instruction.

Summary

As proposed at the beginning of this research endeavor, assessing beliefs regarding participating in online instruction aided identification of the prominent characteristics of online instruction self-efficacy. This study included the development and factor analysis of the TOIS instrument. The overall research approach included (a) an in-depth examination of self-efficacy theory and current characteristics of the online instruction environment, (b) an assessment of the face validity of the instrument through surveying specialists in both fields, (c) a pilot-test the instrument for internal reliability, and (d) a test of the TOIS with a large sample. Three factors emerged as underlying a theoretical model of online instruction self-efficacy. Those factors were Internet/technology, collaborative, and individual behaviors. While the three-factor model was appropriate and was a reasonable fit for this dataset, additional research could validate and refine understanding of the online instruction self-efficacy concept, and substantiate its usefulness in assessing readiness to participate in online instruction experiences. To that end, this attempt to determine the salient characteristics of online instruction self-efficacy is a work in progress.

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APPENDICES

Appendix A
Permission Letter for Study from Executive Director of the NJATC

Subject: NJATC Executive Director's Permission to Conduct Research Study at NTI 2001

Title of Study: Online Instruction Self-Efficacy

Principal Investigator:
Fredrick A. Randall
Department of Human Resource Development
The University of Tennessee
310 Jessie Harris Building
Knoxville, Tennessee 37996-1900

Purpose: The principal investigator is asking for permission to conduct a research study at the National Joint Apprenticeship and Training Committee (NJATC) organization's National Training Institute (NTI) during the week of August 4 – 10, 2001. The purpose of this study is to investigate participant's beliefs about their ability to participate in online instructional experiences. The following policies and procedures will guide the data collection and reporting activities for this research and may be useful to you in reviewing this request.

Procedures: The data collection procedures for this study are as follows: a) The principal investigator will attend the I-group meeting on Saturday, August 4th and explain the study and data collection procedures to the Institute instructors. b) The instructors will be asked to give out questionnaires at their first class meeting and give appropriate time for participants to complete the questionnaire. c) The instructors will be asked to collect the questionnaires and return to the principal investigator when they turn in their class rolls for their first class.

Voluntary participation: All NTI participants who participate in this research will do so voluntarily. Subjects can decline to participate in the survey administration at any time. The instructions to the questionnaire will indicate that participation is voluntary.

Time required: The questionnaire should not take more than 10-15 minutes of the participant's time to complete.

Confidentiality and anonymity: The data gathered in this study will be kept confidential. Data will be stored securely and will be made available only to persons conducting the study. Reports of findings from this study will only present group data and will not link individuals to their responses. The instructions to the questionnaire will contain a confidentiality and anonymity statement.

Feedback: The principal investigator will provide NJATC with information on NTI participant's self-efficacy beliefs regarding online instruction. Recommendations for preparation of learners participating in online learning and instructional methods will be reported to NJATC at the completion of the study.

Potential costs and benefits: The only anticipated cost to individuals participating in this study is the time and attention to complete the questionnaire. The anticipated benefit of this research is to clarify NTI participant's belief in their ability to participate in online instructional experiences. This study will provide insight into situations where participants feel comfortable in their ability to participate in online instructional and areas where they feel uncertain of their abilities. This study will also add to the body of knowledge about the use of the online instruction educational methodology.

Permission to Conduct Research Study at NJATC National Training Institute 2001

I understand the above procedures and policies. Fredrick A. Randall (Principal Investigator from the University of Tennessee) has my permission and support to undertake the following activities in collaboration with the instructors and participants of NTI 2001:

a) To attend the I-group meeting on Saturday, August 4th to inform the instructors of the research procedures for this study and to distribute questionnaire packets to each instructor.

b) To request instructors to give time for class participants to complete the questionnaire during the first day of the class, and give appropriate attention to the questionnaire.

c) To request instructors to collect the completed questionnaires from participants and return to principal investigator when they turn in their roll sheets for their first class.

A.J. Pearson
Executive Director
National Joint Apprenticeship and Training Committee
301 Prince Georges Boulevard, Suite D
Upper Marlboro, MD 20774

Appendix B
Tennessee Online Instruction Scale

TENNESSEE ONLINE INSTRUCTION SCALE

The purpose of this inventory is to obtain information about your beliefs regarding your ability to participate in an online course. Your responses will be kept strictly confidential and your name is not required on this form. This inventory should take less than 10 minutes to complete.

For this inventory, an online course is defined as structured learning experience delivered to a remote audience completely through the use of computers and the Internet. In online instruction, all course activities and interactions with the instructor and other course participants are accomplished without face-to-face contact.

When completing this inventory do not consider your opinion of online instruction, your motivation to participate in online instruction, or your plans to ever participate in online instruction. Focus on your belief in your ability to do each task as if you were actually participating in an online course.

DIRECTIONS:

For each online instruction task listed below, CIRCLE THE NUMBER that most accurately reflects your belief in your ability to do each task if you were participating in an online course. There are seven possible choices for each item:

Never	Almost Never	Seldom	Sometimes	Usually	Almost Always	Always
1	2	3	4	5	6	7

THERE ARE NO RIGHT OR WRONG ANSWERS. There also is no time limit, but you should work as rapidly as possible. Please answer truthfully and completely as possible for each item in the inventory.

If participating in an online course, I believe I could:

Online Instruction Task:	Never 1	2	3	4	5	6	Always 7
1. Complete a project with other course participants	1	2	3	4	5	6	7
2. Take an online test on course subject matter	1	2	3	4	5	6	7
3. Stay involved with the course without face-to-face interaction with other course participants	1	2	3	4	5	6	7
4. Work alone	1	2	3	4	5	6	7
5. Learn from information presented in a video format	1	2	3	4	5	6	7
6. Find my way (navigate) around websites	1	2	3	4	5	6	7
7. Prioritize my own course activity workload	1	2	3	4	5	6	7
8. Use an Internet browser	1	2	3	4	5	6	7
9. Critique my instructor's performance in teaching the subject matter online	1	2	3	4	5	6	7
10. View an attachment from an incoming email message	1	2	3	4	5	6	7
11. Use email to communicate effectively with other course participants	1	2	3	4	5	6	7
12. Download and install software for my Internet browser that is needed for the course	1	2	3	4	5	6	7
13. Learn from information presented in an audio format	1	2	3	4	5	6	7
14. Evaluate the quality of information found on a website	1	2	3	4	5	6	7
15. Make sense of ambiguous information	1	2	3	4	5	6	7
16. Follow standard online etiquette guidelines	1	2	3	4	5	6	7

If participating in an online course, I believe I could:

Online Instruction Task:	Never 1	2	3	4	5	6	Always 7
17. Keep myself on task	1	2	3	4	5	6	7
18. Learn from reading information presented on a computer screen	1	2	3	4	5	6	7
19. Assess my progress in a course	1	2	3	4	5	6	7
20. Learn to use new software required for the course	1	2	3	4	5	6	7
21. Save a document from the Internet	1	2	3	4	5	6	7
22. Address disagreements between course participants online	1	2	3	4	5	6	7
23. Keep appointments to meet other course participants online for scheduled events	1	2	3	4	5	6	7
24. Participate in a discussion group in which the topic is discussed over a period of time by leaving messages for other participants	1	2	3	4	5	6	7
25. Find information on a website that offered a keyword search feature	1	2	3	4	5	6	7
26. Communicate effectively when my responses will be read by many people	1	2	3	4	5	6	7
27. Use email to communicate effectively with my instructor	1	2	3	4	5	6	7
28. Participate in a live online discussion in which course participants discuss a topic at the same time	1	2	3	4	5	6	7
29. Organize and lead a course project involving other participants	1	2	3	4	5	6	7
30. Stay involved with the course without face-to-face interaction with the instructor	1	2	3	4	5	6	7
31. Participate in group decision making	1	2	3	4	5	6	7
32. Understand what other people are trying to convey in their writing	1	2	3	4	5	6	7
33. Give myself enough time to complete assignments	1	2	3	4	5	6	7
34. Develop a relationship with another course participant	1	2	3	4	5	6	7
35. Give constructive feedback to other course participants	1	2	3	4	5	6	7
36. Attach a file to an email message	1	2	3	4	5	6	7
37. Understand a concept from reviewing materials presented on several different websites	1	2	3	4	5	6	7
38. Plan and manage my own learning needs	1	2	3	4	5	6	7
39. Communicate my thoughts and ideas in writing	1	2	3	4	5	6	7
40. Express my opinion on controversial subject matters	1	2	3	4	5	6	7

(Please continue to the back page)

BACKGROUND INFORMATION

DIRECTIONS:

Please check the appropriate response for each item. Completion of this inventory acknowledges your understanding that this data will be used for research purposes only and will be kept completely confidential.

---

(1) Are you participating in instructor training (professional education) classes at NTI?

yes _____
no _____

(2) If you answered "yes" to Question 1, what year participant are you?

first year _____
second year _____
third year _____
fourth year _____
postgraduate _____
advanced postgraduate _____

(3) Gender:

female _____
male _____

(4) Age:

20 or under _____
21 – 25 _____
26 – 30 _____
31 – 35 _____
36 – 40 _____
41 – 45 _____
46 – 50 _____
51 – 55 _____
over 55 _____

(5) Level of education:

less than high school diploma _____
high school degree or GED _____
2 years of college or Associate's degree _____
a Bachelor's degree _____
some Graduate work _____
a Graduate degree _____

(6) Please circle the number that reflects the extent of your computer experience:

Very Low	Low	Lower than average	Average	Higher than average	High	Very High
1	2	3	4	5	6	7

(7) Please circle the number that reflects the extent of your experience with online instruction:

Very Low	Low	Lower than average	Average	Higher than average	High	Very High
1	2	3	4	5	6	7

(8) Please circle the number that reflects the extent of your Internet experience:

Very Low	Low	Lower than average	Average	Higher than average	High	Very High
1	2	3	4	5	6	7

Appendix C
Pilot Instrument for Self-Efficacy Subject Matter Expert Group

Online Instruction Self-Efficacy Feedback Form

Thank you for your interest in the development of this survey instrument. My name is Fritz Randall and I am a doctoral candidate at the University of Tennessee, Knoxville in the area of Human Resource Development.

I am designing a self-appraisal questionnaire to measure one's self-efficacy beliefs related to participating in online instruction. Please read through the following introductory statement designed to acquaint you with the theoretical / conceptual basis of this survey.

What is self-efficacy and how does it relate to online instruction?

Self-efficacy is a psychological construct developed by Dr. Albert Bandura describing a person's belief in their ability to plan and complete actions necessary for a given task under a given set of conditions. For example, you could rate your belief in your capability to lift an item weighing 50-pounds over your head. It is widely accepted that personal confidence influences behavior, i.e., people engage in activities they feel confident they can undertake and avoid activities when uncertain of their ability to perform well. Since online instruction often involves novel tasks it seems appropriate to examine self-efficacy related to participating in online instruction. For the purposes of this survey instrument, online instruction refers to participation in a structured learning experience with other people where all of the tasks of the course occur wholly online.

How was the questionnaire developed and what is the supposed population?

The population for this questionnaire will be adults that may or may not have experience with online learning. The questionnaire items are based on five theoretical subscales for online learning self-efficacy: activities of online instruction, instructional elements/learning modes, communication/collaboration, self-regulatory skills, and related computer skills. Additionally, to properly assess self-efficacy belief, questions examine tasks with varying levels of difficulty.

How will your information be used?

If you participate in this pilot testing, the data you provide will only be used by me. I will not reveal your name or private information without your expressed permission. You do not have to give your name, organization, title, or email address to participate in this pilot test, but it would help me in categorizing your responses. The data from this pilot study will be considered as expert opinion on self-efficacy and used to revise this survey instrument before final administration.

How can you help?

I would like for you to examine the 65 items below and decide if you think the item is easy to understand and whether the item is an important part of participating in online instruction. I am viewing your responses as expert opinion on the subject of self-efficacy. Please rate each item on your belief of its usefulness/validity to self-efficacy / online instruction using the 5 point rating scale. Under each item is a text box for you to give me additional feedback on the item including its clarity, comments on wording, related

questions you feel are important, etc. Any additional feedback you give about each item, or about the questionnaire in general, is greatly appreciated.

If you would prefer to participate using an offline form, please download the Word format document, complete, and email to me as an attachment.

Questionnaire Stem:
Regarding online instruction, I believe I can:

1. Participate in a live online discussion where everyone discusses the topic at the same time.	❍ Strongly disagree with item's validity	❍ Disagree	❍ Undecided regarding item's validity	❍ Agree	❍ Strongly agree with item's validity
Comments about Item 1:					
2. Post messages in a discussion group where the topic is discussed over several days.	❍ Strongly disagree with item's validity	❍ Disagree	❍ Undecided regarding item's validity	❍ Agree	❍ Strongly agree with item's validity
Comments about Item 2:					
3. Take a multiple-choice / true-false test.	❍ Strongly disagree with item's validity	❍ Disagree	❍ Undecided regarding item's validity	❍ Agree	❍ Strongly agree with item's validity
Comments about Item 3:					
4. Take an essay test.	❍ Strongly disagree with item's validity	❍ Disagree	❍ Undecided regarding item's validity	❍ Agree	❍ Strongly agree with item's validity
Comments about Item 4:					
5. Follow online etiquette guidelines.	❍ Strongly disagree with item's validity	❍ Disagree	❍ Undecided regarding item's validity	❍ Agree	❍ Strongly agree with item's validity
Comments about Item 5:					

6. Stay involved with the course without face-to-face interaction with fellow students.	○ Strongly disagree with item's validity	○ Disagree	○ Undecided regarding item's validity	○ Agree	○ Strongly agree with item's validity
Comments about Item 6:					
7. Stay involved with the course without face-to-face interaction with the instructor.	○ Strongly disagree with item's validity	○ Disagree	○ Undecided regarding item's validity	○ Agree	○ Strongly agree with item's validity
Comments about Item 7:					
8. Learn abstract concepts.	○ Strongly disagree with item's validity	○ Disagree	○ Undecided regarding item's validity	○ Agree	○ Strongly agree with item's validity
Comments about Item 8:					
9. Learn dates and corresponding events.	○ Strongly disagree with item's validity	○ Disagree	○ Undecided regarding item's validity	○ Agree	○ Strongly agree with item's validity
Comments about Item 9:					
10. Use what I learn in an applied (real-life) situation.	○ Strongly disagree with item's validity	○ Disagree	○ Undecided regarding item's validity	○ Agree	○ Strongly agree with item's validity
Comments about Item 10:					
11. Compare and contrast subject matter.	○ Strongly disagree with item's validity	○ Disagree	○ Undecided regarding item's validity	○ Agree	○ Strongly agree with item's validity
Comments about Item 11:					

12. Dissect and analyze subject matter.

○ Strongly disagree with item's validity	○ Disagree	○ Undecided regarding item's validity	○ Agree	○ Strongly agree with item's validity

Comments about Item 12:

13. Generalize a theory from given facts.

○ Strongly disagree with item's validity	○ Disagree	○ Undecided regarding item's validity	○ Agree	○ Strongly agree with item's validity

Comments about Item 13:

14. Understand a concept from reviewing materials presented on several different websites.

○ Strongly disagree with item's validity	○ Disagree	○ Undecided regarding item's validity	○ Agree	○ Strongly agree with item's validity

Comments about Item 14:

15. Evaluate the quality of information found on a website.

○ Strongly disagree with item's validity	○ Disagree	○ Undecided regarding item's validity	○ Agree	○ Strongly agree with item's validity

Comments about Item 15:

16. Make sense of ambiguous information.

○ Strongly disagree with item's validity	○ Disagree	○ Undecided regarding item's validity	○ Agree	○ Strongly agree with item's validity

Comments about Item 16:

17. Use recorded materials, such as audio and video lectures.

○ Strongly disagree with item's validity	○ Disagree	○ Undecided regarding item's validity	○ Agree	○ Strongly agree with item's validity

Comments about Item 17:

18. Learn from reading information presented on the computer screen.	○ Strongly disagree with item's validity	○ Disagree	○ Undecided regarding item's validity	○ Agree	○ Strongly agree with item's validity
Comments about Item 18:					
19. Learn from information presented in an audio format.	○ Strongly disagree with item's validity	○ Disagree	○ Undecided regarding item's validity	○ Agree	○ Strongly agree with item's validity
Comments about Item 19:					
20. Learn from information presented in an video format.	○ Strongly disagree with item's validity	○ Disagree	○ Undecided regarding item's validity	○ Agree	○ Strongly agree with item's validity
Comments about Item 20:					
21. Learn from information presented in a virtual reality format.	○ Strongly disagree with item's validity	○ Disagree	○ Undecided regarding item's validity	○ Agree	○ Strongly agree with item's validity
Comments about Item 21:					
22. Learn material presented in any format.	○ Strongly disagree with item's validity	○ Disagree	○ Undecided regarding item's validity	○ Agree	○ Strongly agree with item's validity
Comments about Item 22:					
23. Use email to ask questions.	○ Strongly disagree with item's validity	○ Disagree	○ Undecided regarding item's validity	○ Agree	○ Strongly agree with item's validity
Comments about Item 23:					
24. Use email to ask questions about class content.	○ Strongly disagree with item's validity	○ Disagree	○ Undecided regarding item's validity	○ Agree	○ Strongly agree with item's validity
Comments about Item 24:					

25. Use email to inform the instructor that I a grade I received.	○ Strongly disagree with item's validity	○ Disagree	○ Undecided regarding item's validity	○ Agree	○ Strongly agree with item's validity
Comments about Item 25:					
26. Communicate my ideas in writing.	○ Strongly disagree with item's validity	○ Disagree	○ Undecided regarding item's validity	○ Agree	○ Strongly agree with item's validity
Comments about Item 26:					
27. Be creative in expressing my thoughts and ideas.	○ Strongly disagree with item's validity	○ Disagree	○ Undecided regarding item's validity	○ Agree	○ Strongly agree with item's validity
Comments about Item 27:					
28. Critique my instructor's performance.	○ Strongly disagree with item's validity	○ Disagree	○ Undecided regarding item's validity	○ Agree	○ Strongly agree with item's validity
Comments about Item 28:					
29. Express my opinion on controversial subject matters.	○ Strongly disagree with item's validity	○ Disagree	○ Undecided regarding item's validity	○ Agree	○ Strongly agree with item's validity
Comments about Item 29:					
30. Communicate effectively when my responses will be read by many people.	○ Strongly disagree with item's validity	○ Disagree	○ Undecided regarding item's validity	○ Agree	○ Strongly agree with item's validity
Comments about Item 30:					
31. Explain my thoughts and ideas.	○ Strongly disagree with item's validity	○ Disagree	○ Undecided regarding item's validity	○ Agree	○ Strongly agree with item's validity
Comments about Item 31:					

32. Understand what other people are trying to convey in their writing.	❍ Strongly disagree with item's validity	❍ Disagree	❍ Undecided regarding item's validity	❍ Agree	❍ Strongly agree with item's validity
Comments about Item 32:					
33. Give constructive criticism to peers in a group discussion.	❍ Strongly disagree with item's validity	❍ Disagree	❍ Undecided regarding item's validity	❍ Agree	❍ Strongly agree with item's validity
Comments about Item 33:					
34. Develop a relationship with a fellow student.	❍ Strongly disagree with item's validity	❍ Disagree	❍ Undecided regarding item's validity	❍ Agree	❍ Strongly agree with item's validity
Comments about Item 34:					
35. Participate in group decision making.	❍ Strongly disagree with item's validity	❍ Disagree	❍ Undecided regarding item's validity	❍ Agree	❍ Strongly agree with item's validity
Comments about Item 35:					
36. Complete a project with other course members.	❍ Strongly disagree with item's validity	❍ Disagree	❍ Undecided regarding item's validity	❍ Agree	❍ Strongly agree with item's validity
Comments about Item 36:					
37. Organize and lead a class project.	❍ Strongly disagree with item's validity	❍ Disagree	❍ Undecided regarding item's validity	❍ Agree	❍ Strongly agree with item's validity
Comments about Item 37:					
38. Express my opinion even though it differs from the majority.	❍ Strongly disagree with item's validity	❍ Disagree	❍ Undecided regarding item's validity	❍ Agree	❍ Strongly agree with item's validity
Comments about Item 38:					

39. Address disagreements between peers.	○ Strongly disagree with item's validity	○ Disagree	○ Undecided regarding item's validity	○ Agree	○ Strongly agree with item's validity
Comments about Item 39:					
40. Confront a peer's poor performance in on online group project.	○ Strongly disagree with item's validity	○ Disagree	○ Undecided regarding item's validity	○ Agree	○ Strongly agree with item's validity
Comments about Item 40:					
41. Keep myself on task.	○ Strongly disagree with item's validity	○ Disagree	○ Undecided regarding item's validity	○ Agree	○ Strongly agree with item's validity
Comments about Item 41:					
42. Focus on coursework even when there are distractions.	○ Strongly disagree with item's validity	○ Disagree	○ Undecided regarding item's validity	○ Agree	○ Strongly agree with item's validity
Comments about Item 42:					
43. Be online for a scheduled event.	○ Strongly disagree with item's validity	○ Disagree	○ Undecided regarding item's validity	○ Agree	○ Strongly agree with item's validity
Comments about Item 43:					
44. Keep up with class assignments.	○ Strongly disagree with item's validity	○ Disagree	○ Undecided regarding item's validity	○ Agree	○ Strongly agree with item's validity
Comments about Item 44:					
45. Stay engaged with the course without regular instructor feedback.	○ Strongly disagree with item's validity	○ Disagree	○ Undecided regarding item's validity	○ Agree	○ Strongly agree with item's validity
Comments about Item 45:					

46. Complete an assignment for which I received minimal directions.	❍ Strongly disagree with item's validity	❍ Disagree	❍ Undecided regarding item's validity	❍ Agree	❍ Strongly agree with item's validity
Comments about Item 46:					
47. Work alone.	❍ Strongly disagree with item's validity	❍ Disagree	❍ Undecided regarding item's validity	❍ Agree	❍ Strongly agree with item's validity
Comments about Item 47:					
48. Prepare myself for an exam without study guidelines.	❍ Strongly disagree with item's validity	❍ Disagree	❍ Undecided regarding item's validity	❍ Agree	❍ Strongly agree with item's validity
Comments about Item 48:					
49. Prioritize my own course activity workload.	❍ Strongly disagree with item's validity	❍ Disagree	❍ Undecided regarding item's validity	❍ Agree	❍ Strongly agree with item's validity
Comments about Item 49:					
50. Plan and manage my own learning needs.	❍ Strongly disagree with item's validity	❍ Disagree	❍ Undecided regarding item's validity	❍ Agree	❍ Strongly agree with item's validity
Comments about Item 50:					
51. Evaluate my own performance on an assignment.	❍ Strongly disagree with item's validity	❍ Disagree	❍ Undecided regarding item's validity	❍ Agree	❍ Strongly agree with item's validity
Comments about Item 51:					
52. Assess my progress in a course.	❍ Strongly disagree with item's validity	❍ Disagree	❍ Undecided regarding item's validity	❍ Agree	❍ Strongly agree with item's validity
Comments about Item 52:					

53. Give myself enough time to complete assignments.	❍ Strongly disagree with item's validity	❍ Disagree	❍ Undecided regarding item's validity	❍ Agree	❍ Strongly agree with item's validity
Comments about Item 53:					
54. Assess the quality of my work compared to other students in the course.	❍ Strongly disagree with item's validity	❍ Disagree	❍ Undecided regarding item's validity	❍ Agree	❍ Strongly agree with item's validity
Comments about Item 54:					
55. Meet all expectations of me in a course.	❍ Strongly disagree with item's validity	❍ Disagree	❍ Undecided regarding item's validity	❍ Agree	❍ Strongly agree with item's validity
Comments about Item 55:					
56. Search a website.	❍ Strongly disagree with item's validity	❍ Disagree	❍ Undecided regarding item's validity	❍ Agree	❍ Strongly agree with item's validity
Comments about Item 56:					
57. Overcome any technological challenges that occur with the computer I am using.	❍ Strongly disagree with item's validity	❍ Disagree	❍ Undecided regarding item's validity	❍ Agree	❍ Strongly agree with item's validity
Comments about Item 57:					
58. Attach a file to an email message.	❍ Strongly disagree with item's validity	❍ Disagree	❍ Undecided regarding item's validity	❍ Agree	❍ Strongly agree with item's validity
Comments about Item 58:					
59. Use an Internet browser.	❍ Strongly disagree with item's validity	❍ Disagree	❍ Undecided regarding item's validity	❍ Agree	❍ Strongly agree with item's validity
Comments about Item 59:					

60. View an attachment from an incoming email message.	○ Strongly disagree with item's validity	○ Disagree	○ Undecided regarding item's validity	○ Agree	○ Strongly agree with item's validity
Comments about Item 60:					
61. Save a document from the Internet.	○ Strongly disagree with item's validity	○ Disagree	○ Undecided regarding item's validity	○ Agree	○ Strongly agree with item's validity
Comments about Item 61:					
62. Resolve any technical difficulties in accessing materials on the Internet.	○ Strongly disagree with item's validity	○ Disagree	○ Undecided regarding item's validity	○ Agree	○ Strongly agree with item's validity
Comments about Item 62:					
63. Find my way around any website.	○ Strongly disagree with item's validity	○ Disagree	○ Undecided regarding item's validity	○ Agree	○ Strongly agree with item's validity
Comments about Item 63:					
64. Acquire new computer skills required to participate in the course.	○ Strongly disagree with item's validity	○ Disagree	○ Undecided regarding item's validity	○ Agree	○ Strongly agree with item's validity
Comments about Item 64:					
65. Download and install software for my Internet browser that is needed for the course.	○ Strongly disagree with item's validity	○ Disagree	○ Undecided regarding item's validity	○ Agree	○ Strongly agree with item's validity
Comments about Item 65:					

Appendix D
Pilot Instrument for Online Instruction Subject Matter Expert Group

Online Instruction Self-Efficacy Feedback Form

Thank you for your interest in the development of this survey instrument. My name is Fritz Randall and I am a doctoral candidate at the University of Tennessee, Knoxville in the area of Human Resource Development.

I am designing a self-appraisal questionnaire to measure one's self-efficacy beliefs related to participating in online instruction. Please read through the following introductory statement designed to acquaint you with the theoretical / conceptual basis of this survey.

What is self-efficacy and how does it relate to online instruction?

Self-efficacy is a psychological construct developed by Dr. Albert Bandura describing a person's belief in their ability to plan and complete actions necessary for a given task under a given set of conditions. For example, you could rate your belief in your capability to lift an item weighing 50-pounds over your head. It is widely accepted that personal confidence influences behavior, i.e., people engage in activities they feel confident they can undertake and avoid activities when uncertain of their ability to perform well. Since online instruction often involves novel tasks it seems appropriate to examine self-efficacy related to participating in online instruction. For the purposes of this survey instrument, online instruction refers to participation in a structured learning experience with other people where all of the tasks of the course occur wholly online.

How was the questionnaire developed and what is the supposed population?

The population for this questionnaire will be adults that may or may not have experience with online learning. The questionnaire items are based on five theoretical subscales for online learning self-efficacy: activities of online instruction, instructional elements/learning modes, communication/collaboration, self-regulatory skills, and related computer skills. Additionally, to properly assess self-efficacy belief, questions examine tasks with varying levels of difficulty.

How will your information be used?

If you participate in this pilot testing, the data you provide will only be used by me. I will not reveal your name or private information without your expressed permission. You do not have to give your name, organization, title, or email address to participate in this pilot test, but it would help me in categorizing your responses. The data from this pilot study will be considered as expert opinion on online instruction and used to revise this survey instrument before final administration.

How can you help?

I would like for you to examine the 65 items below and decide if you think the item is easy to understand and whether the item is an important part of participating in online instruction. I am viewing your responses as expert opinion on the subject of online learning/instruction. Please rate each item on your belief of its usefulness/validity to online instruction using the 5 point rating scale. Under each item is a text box for you to give me additional feedback on the item including its clarity, comments on wording,

related questions you feel are important, etc. Any additional feedback you give about each item, or about the questionnaire in general, is greatly appreciated.

If you would prefer to participate using an offline form, please download the Word format document, complete, and email to me as an attachment.

Questionnaire Stem:
Regarding online instruction, I believe I can:

1. Participate in a live online discussion where everyone discusses the topic at the same time.	○ Strongly disagree with item's validity	○ Disagree	○ Undecided regarding item's validity	○ Agree	○ Strongly agree with item's validity
Comments about Item 1:					
2. Post messages in a discussion group where the topic is discussed over several days.	○ Strongly disagree with item's validity	○ Disagree	○ Undecided regarding item's validity	○ Agree	○ Strongly agree with item's validity
Comments about Item 2:					
3. Take a multiple-choice / true-false test.	○ Strongly disagree with item's validity	○ Disagree	○ Undecided regarding item's validity	○ Agree	○ Strongly agree with item's validity
Comments about Item 3:					
4. Take an essay test.	○ Strongly disagree with item's validity	○ Disagree	○ Undecided regarding item's validity	○ Agree	○ Strongly agree with item's validity
Comments about Item 4:					
5. Follow online etiquette guidelines.	○ Strongly disagree with item's validity	○ Disagree	○ Undecided regarding item's validity	○ Agree	○ Strongly agree with item's validity
Comments about Item 5:					

6. Stay involved with the course without face-to-face interaction with fellow students.	❍ Strongly disagree with item's validity	❍ Disagree	❍ Undecided regarding item's validity	❍ Agree	❍ Strongly agree with item's validity
Comments about Item 6:					
7. Stay involved with the course without face-to-face interaction with the instructor.	❍ Strongly disagree with item's validity	❍ Disagree	❍ Undecided regarding item's validity	❍ Agree	❍ Strongly agree with item's validity
Comments about Item 7:					
8. Learn abstract concepts.	❍ Strongly disagree with item's validity	❍ Disagree	❍ Undecided regarding item's validity	❍ Agree	❍ Strongly agree with item's validity
Comments about Item 8:					
9. Learn dates and corresponding events.	❍ Strongly disagree with item's validity	❍ Disagree	❍ Undecided regarding item's validity	❍ Agree	❍ Strongly agree with item's validity
Comments about Item 9:					
10. Use what I learn in an applied (real-life) situation.	❍ Strongly disagree with item's validity	❍ Disagree	❍ Undecided regarding item's validity	❍ Agree	❍ Strongly agree with item's validity
Comments about Item 10:					
11. Compare and contrast subject matter.	❍ Strongly disagree with item's validity	❍ Disagree	❍ Undecided regarding item's validity	❍ Agree	❍ Strongly agree with item's validity
Comments about Item 11:					

12. Dissect and analyze subject matter.	❍ Strongly disagree with item's validity	❍ Disagree	❍ Undecided regarding item's validity	❍ Agree	❍ Strongly agree with item's validity
Comments about Item 12:					
13. Generalize a theory from given facts.	❍ Strongly disagree with item's validity	❍ Disagree	❍ Undecided regarding item's validity	❍ Agree	❍ Strongly agree with item's validity
Comments about Item 13:					
14. Understand a concept from reviewing materials presented on several different websites.	❍ Strongly disagree with item's validity	❍ Disagree	❍ Undecided regarding item's validity	❍ Agree	❍ Strongly agree with item's validity
Comments about Item 14:					
15. Evaluate the quality of information found on a website.	❍ Strongly disagree with item's validity	❍ Disagree	❍ Undecided regarding item's validity	❍ Agree	❍ Strongly agree with item's validity
Comments about Item 15:					
16. Make sense of ambiguous information.	❍ Strongly disagree with item's validity	❍ Disagree	❍ Undecided regarding item's validity	❍ Agree	❍ Strongly agree with item's validity
Comments about Item 16:					
17. Use recorded materials, such as audio and video lectures.	❍ Strongly disagree with item's validity	❍ Disagree	❍ Undecided regarding item's validity	❍ Agree	❍ Strongly agree with item's validity
Comments about Item 17:					

18. Learn from reading information presented on the computer screen.	○ Strongly disagree with item's validity	○ Disagree	○ Undecided regarding item's validity	○ Agree	○ Strongly agree with item's validity
Comments about Item 18:					
19. Learn from information presented in an audio format.	○ Strongly disagree with item's validity	○ Disagree	○ Undecided regarding item's validity	○ Agree	○ Strongly agree with item's validity
Comments about Item 19:					
20. Learn from information presented in an video format.	○ Strongly disagree with item's validity	○ Disagree	○ Undecided regarding item's validity	○ Agree	○ Strongly agree with item's validity
Comments about Item 20:					
21. Learn from information presented in a virtual reality format.	○ Strongly disagree with item's validity	○ Disagree	○ Undecided regarding item's validity	○ Agree	○ Strongly agree with item's validity
Comments about Item 21:					
22. Learn material presented in any format.	○ Strongly disagree with item's validity	○ Disagree	○ Undecided regarding item's validity	○ Agree	○ Strongly agree with item's validity
Comments about Item 22:					
23. Use email to ask questions.	○ Strongly disagree with item's validity	○ Disagree	○ Undecided regarding item's validity	○ Agree	○ Strongly agree with item's validity
Comments about Item 23:					
24. Use email to ask questions about class content.	○ Strongly disagree with item's validity	○ Disagree	○ Undecided regarding item's validity	○ Agree	○ Strongly agree with item's validity
Comments about Item 24:					

25. Use email to inform the instructor that I a grade I received.	○ Strongly disagree with item's validity	○ Disagree	○ Undecided regarding item's validity	○ Agree	○ Strongly agree with item's validity
Comments about Item 25:					
26. Communicate my ideas in writing.	○ Strongly disagree with item's validity	○ Disagree	○ Undecided regarding item's validity	○ Agree	○ Strongly agree with item's validity
Comments about Item 26:					
27. Be creative in expressing my thoughts and ideas.	○ Strongly disagree with item's validity	○ Disagree	○ Undecided regarding item's validity	○ Agree	○ Strongly agree with item's validity
Comments about Item 27:					
28. Critique my instructor's performance.	○ Strongly disagree with item's validity	○ Disagree	○ Undecided regarding item's validity	○ Agree	○ Strongly agree with item's validity
Comments about Item 28:					
29. Express my opinion on controversial subject matters.	○ Strongly disagree with item's validity	○ Disagree	○ Undecided regarding item's validity	○ Agree	○ Strongly agree with item's validity
Comments about Item 29:					
30. Communicate effectively when my responses will be read by many people.	○ Strongly disagree with item's validity	○ Disagree	○ Undecided regarding item's validity	○ Agree	○ Strongly agree with item's validity
Comments about Item 30:					
31. Explain my thoughts and ideas.	○ Strongly disagree with item's validity	○ Disagree	○ Undecided regarding item's validity	○ Agree	○ Strongly agree with item's validity
Comments about Item 31:					

32. Understand what other people are trying to convey in their writing.	❍ Strongly disagree with item's validity	❍ Disagree	❍ Undecided regarding item's validity	❍ Agree	❍ Strongly agree with item's validity
Comments about Item 32:					
33. Give constructive criticism to peers in a group discussion.	❍ Strongly disagree with item's validity	❍ Disagree	❍ Undecided regarding item's validity	❍ Agree	❍ Strongly agree with item's validity
Comments about Item 33:					
34. Develop a relationship with a fellow student.	❍ Strongly disagree with item's validity	❍ Disagree	❍ Undecided regarding item's validity	❍ Agree	❍ Strongly agree with item's validity
Comments about Item 34:					
35. Participate in group decision making.	❍ Strongly disagree with item's validity	❍ Disagree	❍ Undecided regarding item's validity	❍ Agree	❍ Strongly agree with item's validity
Comments about Item 35:					
36. Complete a project with other course members.	❍ Strongly disagree with item's validity	❍ Disagree	❍ Undecided regarding item's validity	❍ Agree	❍ Strongly agree with item's validity
Comments about Item 36:					
37. Organize and lead a class project.	❍ Strongly disagree with item's validity	❍ Disagree	❍ Undecided regarding item's validity	❍ Agree	❍ Strongly agree with item's validity
Comments about Item 37:					
38. Express my opinion even though it differs from the majority.	❍ Strongly disagree with item's validity	❍ Disagree	❍ Undecided regarding item's validity	❍ Agree	❍ Strongly agree with item's validity
Comments about Item 38:					

39. Address disagreements between peers.	❍ Strongly disagree with item's validity	❍ Disagree	❍ Undecided regarding item's validity	❍ Agree	❍ Strongly agree with item's validity
Comments about Item 39:					
40. Confront a peer's poor performance in on online group project.	❍ Strongly disagree with item's validity	❍ Disagree	❍ Undecided regarding item's validity	❍ Agree	❍ Strongly agree with item's validity
Comments about Item 40:					
41. Keep myself on task.	❍ Strongly disagree with item's validity	❍ Disagree	❍ Undecided regarding item's validity	❍ Agree	❍ Strongly agree with item's validity
Comments about Item 41:					
42. Focus on coursework even when there are distractions.	❍ Strongly disagree with item's validity	❍ Disagree	❍ Undecided regarding item's validity	❍ Agree	❍ Strongly agree with item's validity
Comments about Item 42:					
43. Be online for a scheduled event.	❍ Strongly disagree with item's validity	❍ Disagree	❍ Undecided regarding item's validity	❍ Agree	❍ Strongly agree with item's validity
Comments about Item 43:					
44. Keep up with class assignments.	❍ Strongly disagree with item's validity	❍ Disagree	❍ Undecided regarding item's validity	❍ Agree	❍ Strongly agree with item's validity
Comments about Item 44:					
45. Stay engaged with the course without regular instructor feedback.	❍ Strongly disagree with item's validity	❍ Disagree	❍ Undecided regarding item's validity	❍ Agree	❍ Strongly agree with item's validity
Comments about Item 45:					

46. Complete an assignment for which I received minimal directions.	○ Strongly disagree with item's validity	○ Disagree	○ Undecided regarding item's validity	○ Agree	○ Strongly agree with item's validity
Comments about Item 46:					
47. Work alone.	○ Strongly disagree with item's validity	○ Disagree	○ Undecided regarding item's validity	○ Agree	○ Strongly agree with item's validity
Comments about Item 47:					
48. Prepare myself for an exam without study guidelines.	○ Strongly disagree with item's validity	○ Disagree	○ Undecided regarding item's validity	○ Agree	○ Strongly agree with item's validity
Comments about Item 48:					
49. Prioritize my own course activity workload.	○ Strongly disagree with item's validity	○ Disagree	○ Undecided regarding item's validity	○ Agree	○ Strongly agree with item's validity
Comments about Item 49:					
50. Plan and manage my own learning needs.	○ Strongly disagree with item's validity	○ Disagree	○ Undecided regarding item's validity	○ Agree	○ Strongly agree with item's validity
Comments about Item 50:					
51. Evaluate my own performance on an assignment.	○ Strongly disagree with item's validity	○ Disagree	○ Undecided regarding item's validity	○ Agree	○ Strongly agree with item's validity
Comments about Item 51:					
52. Assess my progress in a course.	○ Strongly disagree with item's validity	○ Disagree	○ Undecided regarding item's validity	○ Agree	○ Strongly agree with item's validity
Comments about Item 52:					

53. Give myself enough time to complete assignments.	❍ Strongly disagree with item's validity	❍ Disagree	❍ Undecided regarding item's validity	❍ Agree	❍ Strongly agree with item's validity
Comments about Item 53:					
54. Assess the quality of my work compared to other students in the course.	❍ Strongly disagree with item's validity	❍ Disagree	❍ Undecided regarding item's validity	❍ Agree	❍ Strongly agree with item's validity
Comments about Item 54:					
55. Meet all expectations of me in a course.	❍ Strongly disagree with item's validity	❍ Disagree	❍ Undecided regarding item's validity	❍ Agree	❍ Strongly agree with item's validity
Comments about Item 55:					
56. Search a website.	❍ Strongly disagree with item's validity	❍ Disagree	❍ Undecided regarding item's validity	❍ Agree	❍ Strongly agree with item's validity
Comments about Item 56:					
57. Overcome any technological challenges that occur with the computer I am using.	❍ Strongly disagree with item's validity	❍ Disagree	❍ Undecided regarding item's validity	❍ Agree	❍ Strongly agree with item's validity
Comments about Item 57:					
58. Attach a file to an email message.	❍ Strongly disagree with item's validity	❍ Disagree	❍ Undecided regarding item's validity	❍ Agree	❍ Strongly agree with item's validity
Comments about Item 58:					
59. Use an Internet browser.	❍ Strongly disagree with item's validity	❍ Disagree	❍ Undecided regarding item's validity	❍ Agree	❍ Strongly agree with item's validity
Comments about Item 59:					

60. View an attachment from an incoming email message.	○ Strongly disagree with item's validity	○ Disagree	○ Undecided regarding item's validity	○ Agree	○ Strongly agree with item's validity
Comments about Item 60:					
61. Save a document from the Internet.	○ Strongly disagree with item's validity	○ Disagree	○ Undecided regarding item's validity	○ Agree	○ Strongly agree with item's validity
Comments about Item 61:					
62. Resolve any technical difficulties in accessing materials on the Internet.	○ Strongly disagree with item's validity	○ Disagree	○ Undecided regarding item's validity	○ Agree	○ Strongly agree with item's validity
Comments about Item 62:					
63. Find my way around any website.	○ Strongly disagree with item's validity	○ Disagree	○ Undecided regarding item's validity	○ Agree	○ Strongly agree with item's validity
Comments about Item 63:					
64. Acquire new computer skills required to participate in the course.	○ Strongly disagree with item's validity	○ Disagree	○ Undecided regarding item's validity	○ Agree	○ Strongly agree with item's validity
Comments about Item 64:					
65. Download and install software for my Internet browser that is needed for the course.	○ Strongly disagree with item's validity	○ Disagree	○ Undecided regarding item's validity	○ Agree	○ Strongly agree with item's validity
Comments about Item 65:					

Appendix E
Descriptive Statistics for Pilot Study

Item	Percentage of Responses							*n*	Mean	SD
	Never	***Almost Never***	***Seldom***	***Sometimes***	***Usually***	***Almost Always***	***Always***			
Course Activity Items Group										
2. Take an online test on course subject matter	0	1 3.8%	0	2 7.7%	3 11.5%	6 23.1%	14 53.8%	26	6.12	1.28
6. Find my way (navigate) around websites	0	2 7.7%	0	3 11.5%	4 15.4%	7 26.9%	10 38.5%	26	5.69	1.49
8. Use an Internet browser	0	2 7.7%	0	3 11.5%	3 11.5%	5 19.2%	13 50.0%	26	5.85	1.54
9. Critique my instructor's performance in teaching the subject matter online	0	1 3.8%	1 3.89	4 15.4%	4 15.4%	7 26.9%	9 34.6%	26	5.62	1.42
10. View an attachment from an incoming email message	0	1 3.8%	1 3.8%	2 7.7%	2 7.7%	3 11.5%	17 65.4%	26	6.15	1.43
12. Download and install software for my Internet browser that is needed for the course	1 3.8%	0	2 7.7%	3 11.5%	2 7.7%	9 34.6%	9 34.6%	26	5.62	1.58
20. Learn to use new software required for the course	0	2 7.7%	3 11.5%	2 7.7%	7 26.9%	4 15.4%	8 30.8%	26	5.23	1.63
21. Save a document from the Internet	0	1 3.8%	2 7.7%	3 11.5%	1 3.8%	4 15.4%	15 57.7%	26	5.92	1.57
25. Find information on a website that offered a keyword search feature	0	0	2 7.7%	2 7.7%	0	8 30.8%	14 53.8%	26	6.08	1.47
36. Attach a file to an email message	0	3 11.5%	1 3.8%	2 7.7%	0	5 19.2%	15 57.7%	26	5.85	1.78
Self-Regulation Items Group										

Item	Percentage of Responses							*n*	Mean	SD
	Never	***Almost Never***	***Seldom***	***Sometimes***	***Usually***	***Almost Always***	***Always***			
3. Stay involved with the course without face-to-face interaction with other course participants	1 3.8%	1 3.8%	1 3.8%	2 7.7%	6 23.1%	5 19.2%	10 38.5%	26	5.54	1.65
4. Work alone	0	2 7.7%	0	2 7.7%	2 7.7%	9 34.6%	11 42.3%	26	5.88	1.45
7. Prioritize my own course activity workload	0	3 11.5%	0	2 7.7%	3 11.5%	11 42.3%	7 26.9%	26	5.54	1.56
16. Follow standard online etiquette guidelines	0	1 3.8%	1 3.8%	1 3.8%	7 26.9%	5 19.2%	11 42.3%	26	5.81	1.36
17. Keep myself on task.	0	0	3 11.5%	2 7.7%	4 15.4%	11 42.3%	6 23.1%	26	5.58	1.27
19. Assess my progress in a course	0	0	3 11.5%	1 3.8%	7 26.9%	8 30.8%	7 26.9%	26	5.58	1.27
23. Keep appointments to meet other participants online for scheduled events	0	2 7.7%	0	2 7.7%	4 15.4%	9 34.6%	9 34.6%	26	5.73	1.43
30. Stay involved with the course without face-to-face interaction with the instructor	0	2 7.7%	1 3.8%	2 7.7%	4 15.4%	7 26.9%	10 38.5%	26	5.65	1.55
33. Give myself enough time to complete assignments.	0	1 3.8%	2 7.7%	3 11.5%	5 19.2%	9 34.6%	6 23.1%	26	5.42	1.39
38. Plan and manage my own learning needs.	0	2 7.7%	1 3.8%	2 7.7%	2 7.7%	12 46.2%	7 26.9%	26	5.62	1.47

Item	Percentage of Responses							*n*	Mean	SD
	Never	***Almost Never***	***Seldom***	***Sometimes***	***Usually***	***Almost Always***	***Always***			
Collaboration Items Group										
1. Complete a project with other course participants	0	2 7.7%	0	1 3.8%	7 26.9%	12 46.2%	4 15.4%	26	5.50	1.27
24. Participate in a discussion group in which the topic is discussed over a period of time by leaving a message for participants	0	1 3.8%	1 3.8%	1 3.8%	4 15.4%	9 34.6%	10 38.5%	26	5.88	1.31
28. Participate in a live online discussion in which course participants discuss a topic at the same time	0	1 3.8%	3 11.5%	2 7.7%	6 23.1%	5 19.2%	9 34.6%	26	5.46	1.53
29. Organize and lead a course project involving other participants	0	2 7.7%	3 11.5%	3 11.5%	7 26.9%	8 30.8%	3 11.5%	26	4.96	1.46
31. Participate in group decision making	0	1 3.8%	0	1 3.8%	4 15.4%	8 30.8%	9 34.6%	26	5.62	1.50
34. Develop a relationship with another course participant	0	0	6 23.1%	2 7.7%	4 15.4%	8 30.8%	6 23.1%	26	5.23	1.50
Communication Items Group										
11. Use email to communicate effectively with other course participants	0	1 3.8%	0	2 7.7%	3 11.5%	3 11.5%	17 65.4%	26	6.23	1.31
22. Address disagreements between course participants online	0	2 7.7%	3 11.5%	2 7.7%	6 23.1%	7 26.9%	6 23.1%	26	5.19	1.58
26. Communicate effectively when my responses will be read by many people.	0	2 7.7%	1 3.8%	0	4 15.4%	10 38.5%	9 34.6%	26	5.77	1.45

Item	Percentage of Responses							*n*	Mean	SD
	Never	***Almost Never***	***Seldom***	***Sometimes***	***Usually***	***Almost Always***	***Always***			
27. Use email to communicate effectively with my instructor	0	0	2 7.7%	1 3.8%	1 3.8%	7 26.9%	15 57.7%	26	6.23	1.21
32. Understand what other people are trying to convey in their writing.	0	0	3 11.5%	6 23.1%	7 26.9%	8 30.8%	2 7.7%	26	5.00	1.17
35. Give constructive feedback to other course participants	0	1 3.8%	1 3.8%	5 19.2%	4 15.4%	8 30.8%	7 26.9%	26	5.46	1.39
39. Communicate my thoughts and ideas in writing	0	1 3.8%	2 7.7%	1 3.8%	3 11.5%	10 38.5%	9 34.6%	26	5.77	1.39
40. Express my opinion on controversial subject matters.	0	0	1 3.8%	4 15.4%	4 15.4%	5 19.2%	12 46.2%	26	5.88	1.28
Learning Method / Preferences Items Group										
5. Learn from information presented in a video format	0	1 3.8%	1 3.8%	2 7.7%	7 26.9%	5 19.2%	10 38.5%	26	5.69	1.38
13. Learn from the information presented in an audio format	1 3.8%	1 3.8%	0	5 19.2%	9 34.6%	5 19.2%	5 19.2%	26	5.12	1.48
14. Evaluate the quality of information found on a website	0	1 3.8%	1 3.8%	3 11.5%	9 34.6%	5 19.2%	7 26.9%	26	5.42	1.33
15. Make sense of ambiguous information.	0	1 3.8%	2 7.7%	5 19.2%	8 30.8%	7 26.9%	3 11.5%	26	5.04	1.28
18. Learn from reading information presented on a computer screen.	0	0	2 7.7%	2 7.7%	4 15.4%	5 23.1%	12 46.2%	26	5.92	1.29
37. Understand a concept from reviewing materials presented on several different websites	0	2 7.7%	1 3.8%	2 7.7%	2 7.7%	10 38.5%	9 34.6%	26	5.69	1.52

Appendix F
Full Reproduced Correlational Matrix

Item	1. Group project	2. Online test	3. Without face-to-face (peer)	4. Work alone	5. Video format	6. Navigate websites	7. Prioritize activity workload	8. Use browser
1. Group project	.673[b]							
2. Online test	.479	.601[b]						
3. Without face-to-face (peer)	.607	.605	.695[b]					
4. Work alone	.376	.556	.565	.568[b]				
5. Video format	.494	.600	.646	.589	.639[b]			
6. Navigate websites	.272	.483	.411	.470	.448	.764[b]		
7. Prioritize activity workload	.365	.528	.536	.547	.556	.616	.622[b]	
8. Use browser	.276	.480	.404	.458	.438	.749	.597	.736[b]
9. Critique instructor	.573	.557	.615	.493	.563	.496	.526	.492
10. View email attachment	.331	.442	.379	.379	.379	.718	.534	.712
11. Email peers	.411	.451	.433	.385	.407	.683	.539	.675
12. Download / install software	.309	.492	.410	.447	.434	.766	.591	.757
13. Audio format	.465	.565	.595	.549	.587	.538	.577	.526
14. Evaluate website	.452	.533	.559	.517	.546	.640	.619	.624
15. Understand ambiguous information	.505	.472	.551	.441	.501	.482	.514	.470
16. Online etiquette	.361	.510	.499	.508	.514	.675	.620	.659
17. Keep myself on track	.428	.517	.591	.556	.588	.538	.623	.515
18. Computer screen format	.429	.539	.591	.564	.593	.558	.622	.538
19. Assess my progress	.465	.529	.593	.540	.578	.582	.626	.562
20. Learn software	.396	.487	.483	.461	.476	.688	.599	.673
21. Save Internet document	.282	.417	.355	.379	.367	.735	.553	.724
22. Address disagreements	.499	.398	.467	.340	.395	.582	.508	.571
23. Keep appointments	.473	.349	.455	.322	.382	.479	.470	.464
24. Asynchronous discussion	.500	.414	.504	.382	.438	.569	.540	.553
25. Search website	.358	.436	.432	.416	.424	.695	.583	.679
26. Communicate with many	.386	.434	.493	.458	.478	.624	.611	.600
27. Email instructor	.410	.456	.481	.439	.460	.677	.601	.660
28. Synchronous discussion	.498	.376	.470	.334	.394	.548	.504	.534
29. Lead project	.542	.418	.532	.384	.452	.531	.531	.515
30. Without face-to-face (instructor)	.575	.526	.645	.514	.587	.484	.578	.468
31. Decision making	.588	.444	.594	.425	.507	.475	.543	.457
32. Understand others	.439	.419	.530	.449	.494	.495	.563	.471
33. Give myself enough time	.415	.434	.535	.476	.513	.503	.579	.478
34. Develop peer relationship	.448	.299	.448	.310	.373	.399	.456	.378
35. Peer feedback	.486	.373	.504	.375	.435	.493	.527	.472
36. Send email attachment	.312	.383	.347	.338	.339	.708	.529	.696
37. Synthesize from websites	.369	.470	.485	.477	.486	.699	.636	.678
38. Plan own learning needs	.379	.465	.543	.524	.544	.574	.638	.546
39.Communicate in writing	.246	.372	.438	.466	.462	.520	.585	.488
40. Express my opinion	.311	.365	.455	.437	.453	.491	.559	.461

Item	9. Critique instructor	10. View email attachment	11. Email peers	12. Download / install software	13. Audio format	14. Evaluate website	15. Understand ambiguous info.	16. Online etiquette
1. Group project								
2. Online test								
3. Without face-to-face (peer)								
4. Work alone								
5. Video format								
6. Navigate websites								
7. Prioritize activity workload								
8. Use browser								
9. Critique instructor	.605[b]							
10. View email attachment	.499	.733[b]						
11. Email peers	.539	.707	.705[b]					
12. Download / install software	.515	.751	.714	.788[b]				
13. Audio format	.563	.484	.504	.530	.580[b]			
14. Evaluate website	.579	.600	.618	.634	.588	.653[b]		
15. Understand ambiguous information	.548	.470	.517	.481	.520	.564	.533[b]	
16. Online etiquette	.533	.619	.616	.665	.567	.639	.521	.646[b]
17. Keep myself on track	.543	.446	.484	.496	.588	.619	.552	.595
18. Computer screen format	.551	.473	.501	.525	.594	.619	.544	.601
19. Assess my progress	.575	.517	.553	.556	.597	.645	.576	.619
20. Learn software	.547	.665	.667	.692	.551	.646	.538	.647
21. Save Internet document	.475	.730	.702	.754	.480	.607	.466	.635
22. Address disagreements	.553	.621	.665	.603	.486	.608	.563	.571
23. Keep appointments	.502	.495	.555	.478	.449	.553	.532	.506
24. Asynchronous discussion	.558	.579	.631	.571	.513	.623	.581	.582
25. Search website	.517	.677	.678	.697	.519	.637	.525	.642
26. Communicate with many	.522	.568	.599	.594	.544	.644	.559	.631
27. Email instructor	.548	.656	.673	.674	.545	.657	.561	.649
28. Synchronous discussion	.540	.576	.631	.557	.479	.600	.566	.556
29. Lead project	.573	.545	.611	.532	.517	.618	.595	.565
30. Without face-to-face (instructor)	.607	.450	.517	.468	.587	.620	.601	.562
31. Decision making	.593	.472	.556	.463	.542	.618	.617	.549
32. Understand others	.513	.437	.495	.457	.523	.592	.552	.554
33. Give myself enough time	.507	.427	.480	.458	.535	.594	.544	.562
34. Develop peer relationship	.460	.388	.468	.373	.425	.522	.522	.465
35. Peer feedback	.525	.479	.550	.472	.493	.595	.574	.544
36. Send email attachment	.476	.720	.707	.729	.461	.601	.479	.617
37. Synthesize from websites	.538	.649	.659	.683	.564	.670	.557	.672
38. Plan own learning needs	.517	.474	.513	.521	.572	.637	.558	.620
39.Communicate in writing	.407	.395	.424	.449	.492	.560	.472	.559
40. Express my opinion	.431	.394	.438	.431	.485	.557	.494	.540

Item	16. Online etiquette	17. Keep myself on track	18. Computer screen format	19. Assess my progress	20. Learn software	21. Save Internet document	22. Address disagreements	23. Keep Appointments
1. Group project								
2. Online test								
3. Without face-to-face (peer)								
4. Work alone								
5. Video format								
6. Navigate websites								
7. Prioritize activity workload								
8. Use browser								
9. Critique instructor								
10. View email attachment								
11. Email peers								
12. Download / install software								
13. Audio format								
14. Evaluate website								
15. Understand ambiguous information								
16. Online etiquette	.646[b]							
17. Keep myself on track	.595	.680[b]						
18. Computer screen format	.601	.659	.648[b]					
19. Assess my progress	.619	.665	.652	.670[b]				
20. Learn software	.647	.569	.576	.612	.671[b]			
21. Save Internet document	.635	.471	.491	.534	.674	.741[b]		
22. Address disagreements	.571	.519	.511	.581	.635	.620	.720[b]	
23. Keep appointments	.506	.522	.499	.560	.554	.504	.650	.619[b]
24. Asynchronous discussion	.582	.577	.559	.620	.629	.588	.704	.658
25. Search website	.642	.552	.554	.599	.675	.693	.654	.571
26. Communicate with many	.631	.642	.621	.658	.642	.600	.636	.607
27. Email instructor	.649	.593	.588	.634	.680	.673	.676	.608
28. Synchronous discussion	.556	.539	.521	.590	.615	.582	.713	.663
29. Lead project	.565	.587	.564	.627	.613	.551	.707	.673
30. Without face-to-face (instructor)	.562	.653	.633	.661	.566	.452	.598	.593
31. Decision making	.549	.633	.601	.656	.583	.479	.683	.678
32. Understand others	.554	.639	.607	.638	.557	.465	.582	.589
33. Give myself enough time	.562	.654	.622	.645	.553	.459	.554	.565
34. Develop peer relationship	.465	.553	.510	.567	.499	.413	.610	.622
35. Peer feedback	.544	.606	.571	.627	.578	.501	.667	.661
36. Send email attachment	.617	.464	.477	.532	.670	.731	.658	.547
37. Synthesize from websites	.672	.628	.622	.657	.687	.676	.650	.591
38. Plan own learning needs	.620	.700	.669	.686	.600	.516	.563	.570
39.Communicate in writing	.559	.648	.611	.619	.527	.453	.469	.493
40. Express my opinion	.540	.633	.595	.614	.524	.443	.509	.532

Item	24. Asynchronous discussion	25. Search website	26. Communicate with many	27. Email instructor	28. Synchronous discussion	29. Lead project	30. Without face-to-face (instructor)	31. Decision making
1. Group project								
2. Online test								
3. Without face-to-face (peer)								
4. Work alone								
5. Video format								
6. Navigate websites								
7. Prioritize activity workload								
8. Use browser								
9. Critique instructor								
10. View email attachment								
11. Email peers								
12. Download / install software								
13. Audio format								
14. Evaluate website								
15. Understand ambiguous information								
16. Online etiquette								
17. Keep myself on track								
18. Computer screen format								
19. Assess my progress								
20. Learn software								
21. Save Internet document								
22. Address disagreements								
23. Keep appointments								
24. Asynchronous discussion	.709 [b]							
25. Search website	.645	.692 [b]						
26. Communicate with many	.666	.656	.702 [b]					
27. Email instructor	.677	.694	.683	.707 [b]				
28. Synchronous discussion	.710	.636	.648	.668	.718 [b]			
29. Lead project	.718	.625	.664	.667	.719	.735 [b]		
30. Without face-to-face (instructor)	.639	.547	.629	.600	.616	.665	.703 [b]	
31. Decision making	.714	.585	.668	.642	.709	.745	.715	.784 [b]
32. Understand others	.631	.560	.655	.607	.611	.648	.650	.687
33. Give myself enough time	.609	.553	.654	.598	.583	.624	.645	.667
34. Develop peer relationship	.646	.520	.616	.573	.647	.673	.613	.706
35. Peer feedback	.698	.595	.673	.643	.695	.718	.660	.743
36. Send email attachment	.624	.696	.612	.683	.626	.594	.469	.524
37. Synthesize from websites	.664	.699	.703	.711	.645	.649	.605	.631
38. Plan own learning needs	.624	.601	.700	.640	.590	.630	.659	.668
39.Communicate in writing	.540	.536	.650	.571	.504	.540	.571	.578
40. Express my opinion	.573	.534	.646	.575	.545	.581	.593	.620

Item	32. Understand others	33. Give myself enough time	34. Develop peer relationship	35. Peer feedback	36. Send email attachment	37. Synthesize from websites	38. Plan own learning needs	39.Communicate in writing	40. Express my opinion
1. Group project									
2. Online test									
3. Without face-to-face (peer)									
4. Work alone									
5. Video format									
6. Navigate websites									
7. Prioritize activity workload									
8. Use browser									
9. Critique instructor									
10. View email attachment									
11. Email peers									
12. Download / install software									
13. Audio format									
14. Evaluate website									
15. Understand ambiguous information									
16. Online etiquette									
17. Keep myself on track									
18. Computer screen format									
19. Assess my progress									
20. Learn software									
21. Save Internet document									
22. Address disagreements									
23. Keep appointments									
24. Asynchronous discussion									
25. Search website									
26. Communicate with many									
27. Email instructor									
28. Synchronous discussion									
29. Lead project									
30. Without face-to-face (instructor)									
31. Decision making									
32. Understand others	.658[b]								
33. Give myself enough time	.656	.660[b]							
34. Develop peer relationship	.632	.611	.675[b]						
35. Peer feedback	.670	.651	.694	.728[b]					
36. Send email attachment	.487	.472	.465	.545	.736[b]				
37. Synthesize from websites	.624	.625	.567	.639	.676	.731[b]			
38. Plan own learning needs	.684	.696	.615	.663	.517	.680	.749[b]		
39.Communicate in writing	.631	.650	.559	.596	.450	.624	.713	.708[b]	
40. Express my opinion	.639	.648	.594	.628	.454	.613	.695	.675	0.660[b]

Appendix G
Anti-Image Correlational Matrix

Item	1. Group project	2. Online test	3. Without face-to-face (peer)	4. Work alone	5. Video format	6. Navigate websites	8. Use browser
1. Group project	0.959[f]						
2. Online test	-0.174	0.970[f]					
3. Without face-to-face (peer)	-0.217	-0.148	0.958[f]				
4. Work alone	0.051	-0.185	-0.187	0.979[f]			
5. Video format	-0.030	-0.153	-0.122	-0.113	0.968[f]		
6. Navigate websites	0.063	0.035	-0.021	0.003	-0.118	0.966[f]	
8. Use browser	-0.038	-0.021	0.048	-0.084	0.015	-0.495	0.967[f]
9. Critique instructor	-0.174	-0.063	-0.008	-0.019	-0.148	0.005	0.000
10. View email attachment	-0.030	-0.022	0.015	0.012	0.041	-0.019	-0.110
11. Email peers	-0.002	-0.053	-0.058	0.008	0.037	0.009	-0.019
12. Download / install software	0.007	-0.019	-0.007	-0.032	0.094	-0.119	-0.145
13. Audio format	-0.029	-0.025	-0.034	-0.016	-0.251	-0.020	0.033
14. Evaluate website	0.067	0.008	-0.095	-0.036	-0.037	0.009	-0.044
16. Online etiquette	0.001	-0.149	-0.075	-0.011	-0.004	-0.104	-0.038
20. Learn software	-0.016	-0.014	.000	0.023	-0.096	-0.038	-0.032
21. Save Internet document	0.017	0.023	0.081	-0.028	0.052	-0.059	-0.060
22. Address disagreements	-0.040	0.084	-0.032	0.016	0.057	0.036	0.029
23. Keep appointments	-0.027	0.044	0.037	0.006	-0.065	-0.025	0.025
24. Asynchronous discussion	-0.020	-0.004	0.072	-0.041	-0.025	-0.012	0.026
25. Search website	0.098	-0.052	-0.035	0.031	-0.038	-0.104	-0.053
27. Email instructor	0.023	-0.077	0.050	-0.040	0.064	-0.00	0.001
28. Synchronous discussion	-0.068	0.012	0.054	0.061	-0.014	-0.080	0.013
29. Lead project	-0.037	0.063	-0.048	-0.028	0.032	0.040	-0.002
30. Without face-to-face (instructor)	0.079	0.037	-0.366	-0.078	-0.062	0.010	0.017
31. Decision making	-0.233	0.037	-0.007	0.001	0.020	0.045	-0.033
34. Develop peer relationship	-0.039	0.077	0.012	0.032	0.028	0.063	-0.030
35. Peer feedback	0.004	-0.081	-0.015	0.001	-0.011	-0.028	0.0048
36. Send email attachment	-0.024	0.011	-0.037	0.046	0.008	-0.049	0.046
37. Synthesize from websites	0.091	-0.038	0.090	-0.062	-0.050	-0.114	-0.032

[f] Measures of sampling adequacy (MSA)

Item	9. Critique instructor	10. View email attachment	11. Email peers	12. Download / install software	13. Audio format	14. Evaluate website	16. Online etiquette
1. Group project							
2. Online test							
3. Without face-to-face (peer)							
4. Work alone							
5. Video format							
6. Navigate websites							
8. Use browser							
9. Critique instructor	0.979 [f]						
10. View email attachment	-0.083	0.974 [f]					
11. Email peers	-0.128	-0.300	0.969 [f]				
12. Download / install software	0.061	-0.094	-0.206	0.973 [f]			
13. Audio format	-0.025	-0.044	0.063	-0.161	0.976 [f]		
14. Evaluate website	-0.200	-0.072	0.053	-0.144	-0.180	0.979 [f]	
16. Online etiquette	0.015	0.0052	0.031	-0.105	0.036	-0.175	0.978 [f]
20. Learn software	-0.024	-0.003	0.058	-0.170	-0.057	0.008	-0.042
21. Save Internet document	0.002	-0.178	0.056	-0.050	0.023	-0.019	-0.148
22. Address disagreements	-0.064	-0.018	-0.076	-0.034	0.061	-0.096	-0.021
23. Keep appointments	0.058	-0.013	0.004	0.014	0.006	-0.011	-0.125
24. Asynchronous discussion	-0.009	-0.023	-0.081	-0.039	0.025	-0.033	0.087
25. Search website	0.049	0.001	-0.125	0.023	-0.053	0.022	-0.077
27. Email instructor	-0.023	0.037	-0.289	0.0455	-0.003	-0.001	-0.124
28. Synchronous discussion	0.008	0.045	-0.001	0.027	-0.028	-0.040	-0.043
29. Lead project	-0.098	0.036	-0.039	-0.078	0.020	0.076	0.038
30. Without face-to-face (instructor)	-0.067	-0.010	0.039	-0.017	-0.111	0.109	0.051
31. Decision making	0.020	0.058	0.053	0.080	-0.017	-0.078	-0.050
34. Develop peer relationship	0.078	0.007	-0.105	0.139	-0.103	-0.063	-0.094
35. Peer feedback	-0.058	-0.014	0.038	0.07	0.056	-0.106	0.091
36. Send email attachment	0.059	-0.255	-0.053	-0.169	0.039	0.052	0.140
37. Synthesize from websites	-0.039	0.058	0.052	-0.023	-0.026	-0.050	-0.069

[f] Measures of sampling adequacy (MSA)

Item	20. Learn software	21. Save Internet document	22. Address disagreements	23. Keep Appointments	24. Asynchronous discussion	25. Search website	27. Email instructor
1. Group project							
2. Online test							
3. Without face-to-face (peer)							
4. Work alone							
5. Video format							
6. Navigate websites							
8. Use browser							
9. Critique instructor							
10. View email attachment							
11. Email peers							
12. Download / install software							
13. Audio format							
14. Evaluate website							
16. Online etiquette							
20. Learn software	0.986 [f]						
21. Save Internet document	-0.220	0.973 [f]					
22. Address disagreements	-0.055	-0.149	0.984 [f]				
23. Keep appointments	0.0024	-0.007	-0.112	0.984 [f]			
24. Asynchronous discussion	-0.025	0.059	-0.170	-0.203	0.980 [f]		
25. Search website	0.015	-0.144	0.000	-0.000	-0.169	0.984 [f]	
27. Email instructor	-0.141	-0.030	0.030	0.036	-0.148	-0.045	0.978 [f]
28. Synchronous discussion	0.029	0.007	-0.146	-0.131	-0.100	0.018	-0.146
29. Lead project	-0.094	0.062	-0.054	-0.108	0.013	-0.056	-0.042
30. Without face-to-face (instructor)	0.032	-0.045	0.016	-0.068	-0.090	0.098	-0.150
31. Decision making	-0.022	-0.030	-0.088	-0.021	-0.115	-0.114	0.063
34. Develop peer relationship	-0.062	0.055	-0.021	-0.017	-0.020	0.045	0.063
35. Peer feedback	-0.022	0.008	-0.000	-0.089	-0.040	-0.063	-0.084
36. Send email attachment	0.021	-0.250	0.007	-0.001	0.080	-0.065	-0.083
37. Synthesize from websites	-0.038	0.037	-0.100	0.019	-0.013	-0.112	-0.044

[f] Measures of sampling adequacy (MSA)

Item	28. Synchronous discussion	29. Lead project	30. Without face-to-face (instructor)	31. Decision making	34. Develop peer relationship	35. Peer feedback
1. Group project						
2. Online test						
3. Without face-to-face (peer)						
4. Work alone						
5. Video format						
6. Navigate websites						
8. Use browser						
9. Critique instructor						
10. View email attachment						
11. Email peers						
12. Download / install software						
13. Audio format						
14. Evaluate website						
16. Online etiquette						
20. Learn software						
21. Save Internet document						
22. Address disagreements						
23. Keep appointments						
24. Asynchronous discussion						
25. Search website						
27. Email instructor						
28. Synchronous discussion	0.981 [f]					
29. Lead project	-0.260	0.980 [f]				
30. Without face-to-face (instructor)	0.030	-0.107	0.959 [f]			
31. Decision making	-0.061	-0.156	-0.295	0.973 [f]		
34. Develop peer relationship	0.019	-0.119	-0.031	-0.116	0.953 [f]	
35. Peer feedback	-0.094	-0.008	-0.005	-0.104	-0.480	0.967 [f]
36. Send email attachment	-0.086	-0.038	0.090	0.002	-0.086	-0.059
37. Synthesize from websites	0.009	-0.043	-0.185	-0.034	-0.008	-0.034

[f] Measures of sampling adequacy (MSA)

Item	36. Send email attachment	37. Synthesize from websites
1. Group project		
2. Online test		
3. Without face-to-face (peer)		
4. Work alone		
5. Video format		
6. Navigate websites		
8. Use browser		
9. Critique instructor		
10. View email attachment		
11. Email peers		
12. Download / install software		
13. Audio format		
14. Evaluate website		
16. Online etiquette		
20. Learn software		
21. Save Internet document		
22. Address disagreements		
23. Keep appointments		
24. Asynchronous discussion		
25. Search website		
27. Email instructor		
28. Synchronous discussion		
29. Lead project		
30. Without face-to-face (instructor)		
31. Decision making		
34. Develop peer relationship		
35. Peer feedback		
36. Send email attachment	0.966 [f]	
37. Synthesize from websites	-0.289	0.981 [f]

[f] Measures of sampling adequacy (MSA)

Appendix H
Results of Initial Factor Analysis

Rotated Factor Matrix (All Variable Loadings)

	1	2	3	4
1. Complete a project with other course participants	.568	.315	.035	.498
2. Take an online test on course subject matter	.618	.092	.427	.166
3. Stay involved with the course without face-to-face interaction with other course participants	.678	.332	.279	.214
4. Work alone	.603	.152	.419	-.060
5. Learn from information presented in a video format	.647	.253	.388	.063
6. Find my way (navigate) around websites	.765	-.383	.142	-.096
7. Prioritize my own course activity workload	.749	.000	.204	-.137
8. Use an Internet browser	.744	-.392	.152	-.059
9. Critique my instructor's performance in teaching the subject matter online	.707	.109	.155	.261
10. View an attachment from an incoming email message	.723	-.442	.038	.115
11. Use email to communicate effectively with other course participants	.759	-.318	-.0367	.161
12. Download and install software for my Internet browser that is needed for the course	.754	-.444	.144	.029
13. Learn from the information presented in an audio format	.707	.096	.260	.044
14. Evaluate the quality of information found on a website	.801	-.034	.091	.007
15. Make sense of ambiguous information	.707	.128	.004	.124
16. Follow standard online etiquette guidelines	.775	-.141	.134	-.080
17. Keep myself on task	.769	.217	.115	-.165
18. Learn from reading information presented on a computer screen	.760	.157	.175	-.119
19. Assess my progress in a course	.801	.129	.076	-.069
20. Learn to use new software required for the course	.793	-.199	.030	.012
21. Save a document from the Internet	.737	-.443	.003	.004
22. Address disagreements between course participants online	.781	-.099	-.250	.191
23. Keep appointments to meet other participants online for scheduled events	.723	.066	-.283	.101
24. Participate in a discussion group in which the topic is discussed over a period of time by leaving a message for participants	.802	.009	-.232	.098
25. Find information on a website that offered a keyword search feature	.791	-.247	-.061	-.023

	1	2	3	4
26. Communicate effectively when my responses will be read by many people	.816	.003	-.108	-.151
27. Use email to communicate effectively with my instructor	.822	-.150	-.085	-.014
28. Participate in a live online discussion in which course participants discuss a topic at the same time	.779	-.016	-.298	.140
29. Organize and lead a course project involving other participants	.802	.091	-.255	.130
30. Stay involved with the course without face-to-face interaction with the instructor	.784	.285	.005	.078
31. Participate in group decision making	.807	.261	-.228	.110
32. Understand what other people are trying to convey in their writing	.762	.217	-.122	-.118
33. Give myself enough time to complete assignments	.758	.224	-.063	-.171
34. Develop a relationship with another course participant	.701	.232	-.357	-.024
35. Give constructive feedback to other course participants	.782	.169	-.293	-.004
36. Attach a file to an email message	.744	-.409	-.109	.043
37. Understand a concept from reviewing materials presented on several different websites	.834	-.138	-.030	-.121
38. Plan and manage my own learning needs	.804	.173	-.010	-.266
39. Communicate my thoughts and ideas in writing	.712	.159	-.032	-.417
40. Express my opinion on controversial subject matters	.718	.192	-.106	-.309

Eigenvalues: Total Variance Explained, First Five Factors

	Initial Eigenvalues			Rotated Sums of Squared Loadings		
Factor	Total	% of Variance	Cum. %	Total	% of Variance	Cum. %
1	16.553	57.078	57.078	8.312	28.663	28.663
2	1.927	6.644	63.722	6.637	22.887	51.550
3	1.451	5.005	68.727	4.981	17.176	68.727
4	.724	2.497	71.224			
5	.628	1.952	73.388			

Appendix I
Reproduced Correlational Matrix and Rotated Factor Loadings for Final Model

Reproduced Correlational Matrix for Final Model

Item	1. Group project	2. Online test	3. Without face-to-face (peer)	4. Work alone	5. Video format	6. Navigate websites	8. Use browser
1. Group project	.522[b]						
2. Online test	.446	.625[b]					
3. Without face-to-face (peer)	.578	.621	.710[b]				
4. Work alone	.444	.604	.611	.585[b]			
5. Video format	.509	.622	.666	.606	.645[b]		
6. Navigate websites	.311	.511	.438	.482	.450	.769[b]	
8. Use browser	.297	.500	.424	.472	.438	.755	.742[b]
9. Critique instructor	.501	.548	.607	.535	.568	.523	.509
10. View email attachment	.281	.440	.378	.414	.382	.740	.726
11. Email peers	.355	.445	.431	.424	.412	.704	.688
12. Download / install software	.294	.501	.421	.472	.435	.778	.764
13. Audio format	.472	.576	.605	.559	.584	.532	.519
14. Evaluate website	.466	.546	.571	.528	.541	.648	.632
16. Online etiquette	.399	.528	.514	.506	.502	.680	.665
20. Learn software	.404	.492	.493	.472	.470	.695	.678
21. Save Internet document	.277	.419	.362	.394	.362	.746	.731
22. Address disagreements	.447	.384	.463	.375	.398	.600	.582
23. Keep appointments	.468	.351	.466	.347	.387	.492	.474
24. Asynchronous discussion	.494	.418	.516	.410	.444	.573	.554
25. Search website	.376	.456	.452	.436	.428	.704	.688
27. Email instructor	.434	.474	.502	.457	.464	.684	.666
28. Synchronous discussion	.478	.378	.482	.372	.406	.563	.544
29. Lead project	.530	.412	.539	.407	.454	.530	.511
30. Without face-to-face (instructor)	.597	.541	.667	.534	.594	.483	.465
31. Decision making	.591	.451	.608	.449	.513	.481	.461
34. Develop peer relationship	.498	.307	.467	.310	.369	.397	.379
35. Peer feedback	.529	.393	.530	.390	.441	.501	.482
36. Send email attachment	.298	.388	.358	.367	.343	.719	.704
37. Synthesize from websites	.433	.498	.515	.479	.483	.695	.678

Item	9. Critique instructor	10. View email attachment	11. Email peers	12. Download / install software	13. Audio format	14. Evaluate website	16. Online etiquette	20. Learn software
1. Group project								
2. Online test								
3. Without face-to-face (peer)								
4. Work alone								
5. Video format								
6. Navigate websites								
8. Use browser								
9. Critique instructor	.572[b]							
10. View email attachment	.483	.724[b]						
11. Email peers	.518	.693	.687[b]					
12. Download / install software	.514	.750	.710	.788[b]				
13. Audio format	.562	.481	.501	.524	.567[b]			
14. Evaluate website	.589	.617	.633	.646	.577	.652[b]		
16. Online etiquette	.553	.648	.643	.681	.551	.637	.640[b]	
20. Learn software	.555	.675	.678	.698	.540	.652	.652	.680[b]
21. Save Internet document	.479	.736	.707	.757	.471	.620	.651	.685
22. Address disagreements	.533	.608	.650	.601	.482	.619	.593	.649
23. Keep appointments	.506	.500	.562	.488	.448	.561	.518	.571
24. Asynchronous discussion	.560	.574	.628	.570	.508	.625	.588	.638
25. Search website	.534	.693	.692	.710	.514	.645	.651	.686
27. Email instructor	.567	.672	.689	.686	.539	.662	.653	.690
28. Synchronous discussion	.540	.573	.628	.562	.481	.612	.575	.633
29. Lead project	.568	.533	.602	.524	.508	.617	.566	.618
30. Without face-to-face (instructor)	.618	.452	.523	.469	.583	.615	.552	.568
31. Decision making	.598	.476	.561	.470	.538	.616	.548	.592
34. Develop peer relationship	.488	.412	.497	.389	.416	.517	.455	.514
35. Peer feedback	.555	.507	.580	.495	.492	.598	.544	.597
36. Send email attachment	.478	.719	.703	.730	.457	.616	.637	.681
37. Synthesize from websites	.574	.677	.689	.697	.553	.667	.661	.692

Item	21. Save Internet document	22. Address disagreements	23. Keep Appointments	24. Asynchronous discussion	25. Search website	27. Email instructor	28. Synchronous discussion	29. Lead project
1. Group project								
2. Online test								
3. Without face-to-face (peer)								
4. Work alone								
5. Video format								
6. Navigate websites								
8. Use browser								
9. Critique instructor								
10. View email attachment								
11. Email peers								
12. Download / install software								
13. Audio format								
14. Evaluate website								
16. Online etiquette								
20. Learn software								
21. Save Internet document	.752 [b]							
22. Address disagreements	.630	.710 [b]						
23. Keep appointments	.521	.569	.633 [b]					
24. Asynchronous discussion	.593	.703	.665	.707 [b]				
25. Search website	.707	.664	.579	.644	.699 [b]			
27. Email instructor	.686	.689	.619	.680	.699	.711 [b]		
28. Synchronous discussion	.595	.714	.675	.713	.645	.680	.725 [b]	
29. Lead project	.552	.706	.682	.718	.622	.668	.725	.739 [b]
30. Without face-to-face (instructor)	.453	.606	.604	.645	.546	.601	.631	.674
31. Decision making	.489	.687	.684	.715	.584	.644	.716	.749
34. Develop peer relationship	.434	.642	.641	.659	.519	.573	.672	.692
35. Peer feedback	.526	.695	.678	.709	.601	.650	.718	.734
36. Send email attachment	.739	.658	.558	.623	.706	.693	.631	.590
37. Synthesize from websites	.689	.676	.603	.667	.698	.708	.664	.653

Item	30. Without face-to-face (instructor)	31. Decision making	34. Develop peer relationship	35. Peer feedback	36. Send email attachment	37. Synthesize from websites
1. Group project						
2. Online test						
3. Without face-to-face (peer)						
4. Work alone						
5. Video format						
6. Navigate websites						
8. Use browser						
9. Critique instructor						
10. View email attachment						
11. Email peers						
12. Download / install software						
13. Audio format						
14. Evaluate website						
16. Online etiquette						
20. Learn software						
21. Save Internet document						
22. Address disagreements						
23. Keep appointments						
24. Asynchronous discussion						
25. Search website						
27. Email instructor						
28. Synchronous discussion						
29. Lead project						
30. Without face-to-face (instructor)	.714 [b]					
31. Decision making	.722	.782 [b]				
34. Develop peer relationship	.617	.710	.676 [b]			
35. Peer feedback	.668	.747	.694	.731 [b]		
36. Send email attachment	.474	.530	.485	.567	.736 [b]	
37. Synthesize from websites	.600	.630	.552	.633	.690	.708 [b]

Rotated Factor Matrix (All Variable Loadings)

	1	2	3
1. Complete a project with other course participants	.058	.500	.518
2. Take an online test on course subject matter	.333	.120	.706
3. Stay involved with the course without face-to-face interaction with other course participants	.164	.371	.738
4. Work alone	.299	.138	.689
5. Learn from information presented in a video format	.216	.227	.739
6. Find my way (navigate) around websites	.793	.204	.313
8. Use an Internet browser	.783	.185	.306
9. Critique my instructor's performance in teaching the subject matter online	.341	.395	.546
10. View an attachment from an incoming email message	.785	.253	.208
11. Use email to communicate effectively with other course participants	.695	.384	.235
12. Download and install software for my Internet browser that is needed for the course	.816	.193	.290
13. Learn from the information presented in an audio format	.362	.282	.596
14. Evaluate the quality of information found on a website	.535	.401	.451
16. Follow standard online etiquette guidelines	.618	.308	.402
20. Learn to use new software required for the course	.645	.397	.324
21. Save a document from the Internet	.800	.288	.165
22. Address disagreements between course participants online	.517	.636	.190
23. Keep appointments to meet other participants online for scheduled events	.362	.676	.209
24. Participate in a discussion group in which the topic is discussed over a period of time by leaving a message for participants	.447	.659	.267
25. Find information on a website that offered a keyword search feature	.682	.411	.252
27. Use email to communicate effectively with my instructor	.619	.490	.295
28. Participate in a live online discussion in which course participants discuss a topic at the same time	.451	.692	.203
29. Organize and lead a course project involving other participants	.370	.722	.284
30. Stay involved with the course without face-to-face interaction with the instructor	.237	.593	.551
31. Participate in group decision making	.259	.751	.387
34. Develop a relationship with another course participant	.225	.765	.197
35. Give constructive feedback to other course participants	.334	.738	.271
36. Attach a file to an email message	.760	.378	.125
37. Understand a concept from reviewing materials presented on several different websites	.629	.450	.330

Appendix J
Mean Scores for Demographic Variables by Group

Variable		Group	Internet / Technology Behaviors Factor	Collaborative Behaviors Factor	Individual Behaviors Factor
Gender					
	n				
	31	Female	4.91	4.35	4.91
	721	Male	5.25	4.70	5.19
Total *n*	752	Grand Mean	5.08	4.53	5.05
Age					
	n				
	0	20 or less	-	-	-
	3	21-25	3.74	4.00	4.00
	68	26-30	5.51	4.93	5.29
	151	31-35	5.38	4.68	5.12
	155	36-40	5.15	4.60	5.09
	158	41-45	5.22	4.67	5.17
	105	46-50	5.18	4.75	4.75
	85	51-55	5.07	4.61	5.26
	27	55 plus	5.20	4.87	5.28
Total *n*	752	Grand Mean	5.06	4.64	5.00
Level of Educational Attainment					
	n				
	6	less than H.S.	3.64	3.32	3.79
	277	H.S. degree / GED	5.09	4.59	5.10
	362	2 yr. college	5.36	4.78	5.25
	63	Bachelors degree	5.05	4.57	5.07
	25	some grad. work	5.83	5.06	5.47
	7	graduate degree	5.17	4.66	5.13
Total *n*	740	Grand Mean	5.30	4.73	5.20

Variable	Group	Internet / Technology Behaviors Factor	Collaborative Behaviors Factor	Individual Behaviors Factor
Extent of Computer Experience				
n				
38	very low	3.06	3.25	3.91
44	low	3.85	4.06	4.46
130	lower than avg	4.47	4.13	4.80
301	average	5.29	4.71	5.20
136	higher than average	5.96	5.18	5.65
61	high	6.41	5.34	5.68
39	very high	6.70	5.69	5.92
Total *n* 749	Grand Mean	5.11	4.62	5.09
Extent of Online Instruction Experience				
n				
213	very low	4.52	4.09	4.75
142	low	5.04	4.57	5.06
176	lower than average	5.28	4.72	5.26
139	average	5.82	5.14	5.48
49	higher than average	6.25	5.45	5.89
19	high	6.23	5.48	5.38
13	very high	6.86	6.38	6.47
Total *n* 751	Grand Mean	5.71	5.12	5.47
Extent of Internet Experience				
n				
54	very low	3.21	3.41	4.00
49	low	4.10	3.95	4.64
136	lower than average	4.54	4.23	4.86
266	average	5.30	4.72	5.25
111	higher than average	5.96	5.14	5.51
70	high	6.26	5.35	5.75
66	very high	6.58	5.62	5.75
Total *n* 752	Grand Mean	5.14	4.63	5.11

VITA

Fredrick Eugene Brown was born in Fairhope, Alabama on August 8, 1966 and grew up in Baldwin County, which is bordered by the Gulf of Mexico and Mobile Bay. After graduating from high school, he spent several years engaged in the pursuit of arcane knowledge before entering college in 1987. Fritz earned a B.A. with honors from the University of South Alabama in 1992 with a double major in Anthropology and Psychology. During those years he met his future wife, Catherine, while working as a counselor at Camp ASCCA, an Easter Seals summer camp for persons with disabilities.

Fritz and Cathy later moved to Knoxville, Tennessee to pursue graduate degrees. While Cathy earned her M.S. at UTK, Fritz worked as a crisis counselor for several years in the Helen Ross McNabb mental health system. A continued interest in experiential education prompted Fritz to enter the UTK program of Recreation and Tourism Management in the fall of 1995 where his experiences included grant writing activities, the use of experiential education with children with disabilities in the public school system, and the use of ropes courses as an organizational development tool.

Fritz entered the Human Resource Development Ph.D. program in the fall of 1997 and focused his studies on instructional system design, psychometric assessment, adult education, and the use of online instruction as a distance learning delivery medium. During this time he located and met his biological father and later changed his name to Fredrick Augustus Randall. While in the HRD program Fritz participated in designing and developing several online HRD courses and served as the primary instructor for 6 different courses in both traditional and online formats. Fritz was recognized for outstanding teaching as a graduate student in the College of Human Ecology in 1999.