To the Graduate Council:

I am submitting herewith a thesis written by Iryna P. Loboda entitled "The Effect of an Introductory Computer Course on Online Instruction Self-Efficacy of Undergraduate Students". I have examined the final electronic copy of this thesis for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Science, with a major in Human Resource Development.

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The Effect of an Introductory Computer Course on Online Instruction Self-Efficacy of Undergraduate Students

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Abstract

The purpose of this study was to investigate the effect of an introductory computer course on online instruction self-efficacy and significance of demographic variables of gender, age, formal computer training, computer experience, online instruction experience, and Internet experience in relation to online instruction self-efficacy.

This was accomplished by assessing online instruction self-efficacy beliefs of undergraduate students of the College of Human Ecology, the University of Tennessee who were enrolled in an introductory computer course in spring and summer 2002. The population sample included 92 students who completed the Tennessee Online Instruction Scale (TOIS) at the beginning and at the end of the course.

It was found that for the population of this study, online instruction self-efficacy assessed by the TOIS significantly increased at the end of an introductory computer course. The reliability of the TOIS was found to be satisfactory (Cronbach alpha = .97). The demographic variables of formal computer training and online instruction experiences appeared to be significantly related to posttest online instruction self-efficacy beliefs of the subjects. However, since this study did not avoid limitations in the research design, these findings should be confirmed by further research.

This study has implications for administrators, educators, and instructional designers who are involved in building undergraduate programs with online presence.

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CHAPTER I

Introduction

Online instruction is becoming a common instructional method in training and higher education (Alzafiri, 2000; Barnard, 1997; De-Verneil & Berge, 2000; Driscoll, 1999; Hill, 2000; Khan, 1997; Kirschner & Paas, 2001; Molenda & Sullivan, 2000; O'Malley & McCraw, 1999; Owston, 1997; Palloff & Pratt, 1999; Worley, 2000). Corporations, government agencies, and training organizations increasingly introduce online courses in their instruction delivery systems. The industry, a $4.5 billion market in 2001, is predicted to be worth $11 billion by 2005 (McCarthy, 2002).

In academia, a survey conducted by the National Center for Education Statistics indicated that 87% of all large public universities, those with 1,000 or more students offer distance education courses, primarily through the Internet (Worley, 2000). For example, the Massachusetts Institute of Technology recently decided to make the materials for nearly all its courses available on the Internet over the next 10 years (Kirschner & Paas, 2001). Colleges acknowledge the enormous potential of the Internet and World Wide Web for higher education by investing in new educational technology. In total, the online higher-education market is expected to grow to $7 billion in 2003 from $1.2 billion in 1999 (Grimes, 2001)

Rapid informational and technological advances in education place a premium on personal efficacy for academic achievements (Bandura, 2001). Bandura said, “Everyday life is increasingly regulated by complex technologies that most people neither understand nor believe they can do much to influence. The very technologies they create… paradoxically can become a constraining force…” (p. 17). With rapid

technological changes in education, knowledge and technical skills become quickly obsolete. In the past, students' educational development was determined by a school curriculum. Today, when technology and the Internet in particular provide innumerable educational opportunities and associated with them dangers of failures, students need to be confident in their capabilities to control their own learning. Persistent and self-confident learners are more likely to succeed in the academic life.

The concept of self-efficacy was proposed by Bandura (1986) as a central component of social cognitive theory. Self-efficacy refers to judgements people make about their abilities to do a specific task or act in a specific situation. Social cognitive theory and research (Bandura, 1986, 1997; Hackett, 1995; Pajares, 1997; Pervin & John, 2001; Pintrich & Schunk, 1995; Zimmerman, 1995) posit that self-efficacy judgements influence the choice of activities, degree of effort, period of persistence, coping with situations, emotion, and eventually, performance.

Students' beliefs in their ability to perform successfully in online environment may directly affect their academic achievements and performance (Reinhart, 1999). When applying the concept of self-efficacy to online instruction, one may expect that an individual who has a strong sense of capability in dealing with computers and online instruction will be more successful in online learning. Research has provided evidence that there is positive influence of self-efficacy on various aspects of learners' motivation and achievements in online instruction (Hannafin, Hill, & Land, 1997; Joo, Bong, & Choi, 2000; Reinhart, 1999). Shin (1998) suggested that instruction should be designed with regard to self-efficacy as a component of effective learning.

Therefore, there was a need to investigate the sources of online instruction self-efficacy. Some studies found evidence that computer training and experience significantly improved computer self-efficacy (Karsten & Roth, 1998; Smith, 1994; Torkzadeh & Koufteros, 1994). One might expect that computer training affect online instruction self-efficacy as well.

The proposed study contributed to determining the potential effectiveness of an introductory computer course on students' online instruction self-efficacy as well as to investigating the significance of students' demographic variables in relation to online instruction self-efficacy.

Rationale and Need for the Study

Online instruction is becoming a widely used instructional method in training and higher education, which requires students to be confident in their abilities to control their own learning. Research findings of the literature reviewed suggested that self-efficacy should be considered when designing an effective online program.

As online education is blooming, instructional designers are offering design and development guidelines for this type of instruction (Collis & Moonen, 2001; El-Tigi & Branch, 1997; Hacker & Niederhauser; 2000; Hannafin et al., 1997; Reinhart, 1999; Rossett & Sheldon, 2001; Star, 1997). Geer (2000) suggested that adequate training in computer technologies should enhance collaborative interactivity during online courses. None of the reviewed research studies suggested computer training as a factor in influencing students' self-efficacy in online instruction (Hemphill, 2001; Joo et al., 2000; Kagima, 1998; Lim, 2000; Lin, 1999; Nahl, 1996; Ren, 2000; Wang & Newlin, 2002). Meanwhile, computer training was found to be a significant factor in improved computer

self-efficacy (Karsten & Roth, 1998; Smith, 1994; Torkzadeh & Koufteros, 1994). Karsten and Roth suggested that introductory computer courses help students build their confidence in refining and developing skills necessary for computer-related college courses.

Many academic programs require that students take a basic computer course as a prerequisite. The intent is to provide students with basic computer competencies necessary for their academic and professional work. However, consideration of how an introductory computer course could improve students' perceptions of their abilities to participate in online instruction could further promote the course value in an academic program.

The confirmed assumptions about linkage between an introductory computer course and online instruction self-efficacy have important implications for design and development of basic computer training. Investigation of the impact of computer training on online instruction self-efficacy could help educators and instructional designers understand how to utilize online educational technologies more effectively and could provide them with some directions for building effective academic programs with online presence.

The insight into the relationship between online instruction self-efficacy and students' individual characteristics would also be beneficial for instructional designers. The knowledge of how self-efficacy is related to learners' demographic characteristics would allow them to tailor online course design and development to the needs of specific audiences.

When social changes require from individuals self-development, adaptation, and self-renewal, the agentic perspective of social cognitive theory becomes more topical (Bandura, 2001). Bandura identified metacognitive ability of self-efficacy as a core feature of human agency requiring further research. This study exploring online instruction self-efficacy contributes to understanding self-efficacy in a new, fast growing domain, online instruction.

Theoretical Framework of the Study

Self-efficacy construct is embedded in the social cognitive theory (Bandura, 1977, 1986, 1997, 1999, 2001). Therefore, the theoretical framework of this study was based in part on social cognitive theory. The emphasis of the theory on the situation-specific behavior substantiated the investigation of a domain-specific self-efficacy for online instruction. According to the social cognitive theory, human functioning is determined by three interacting factors: (1) behavior, (2) cognitive and other personal factors, and (3) environmental events.

Based on the social cognitive theory, a theoretical model of the present study was built as seen in Figure 1. The assumption was that basic computer training (environmental factor) might affect the cognitive perceptions of students, specifically online instruction self-efficacy. During that computer training, personal factors including gender, age, formal computer training, computer experience, online instruction experience, and Internet experience might also interact with self-efficacy judgments regarding participation in online instruction.

Social cognitive theory also provided a theoretical basis for the instrumentation in the empirical research. It posited that self-perceptions could be a valuable source

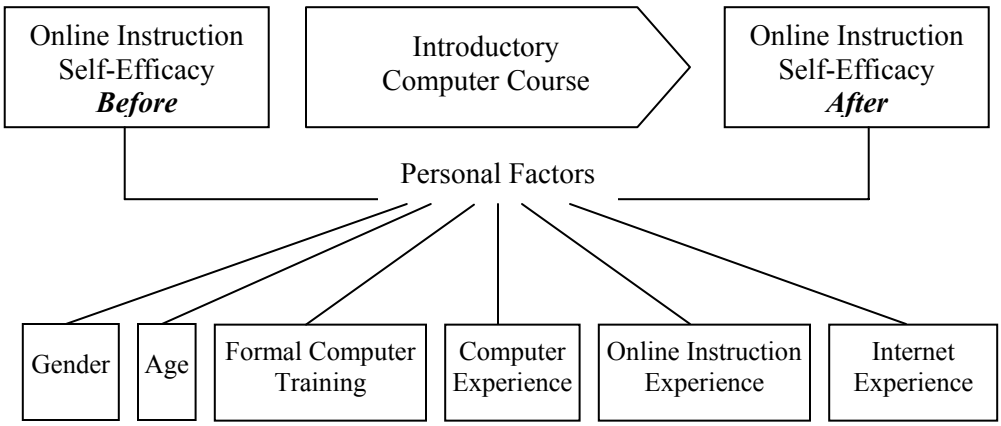

Figure 1. Theoretical Model of the Study.

of information for the educational inquiry (Pajares, 1997). Therefore, the use of self-reports was both legitimate and desirable. On those grounds, a self-report inventory was selected as a research instrument for this study.

Statement of the Problem

Academic programs often have introductory computer courses in their curricula. For example, many business colleges provide an introductory information systems course as an early prerequisite of an undergraduate program (Karsten & Roth, 1998). Many of such courses are designed to provide students with computer and technology competencies necessary in a particular educational environment.

However, the role of introductory computer courses goes beyond merely patching up students' computer deficiency. Computer training has been found to significantly increase computer self-efficacy (Smith, 1994; Torkzadeh & Koufteros, 1994) and motivation to use computers in other academic settings (Larson & Smith, 1994).

Given the demands and opportunities for online instruction, there was a need to investigate the potential value of an introductory computer course for online instruction. It was assumed that an introductory computer course might improve students' beliefs in their abilities to receive online instruction. The gain in online instruction self-efficacy would contribute to their performance in subsequent online core courses, eventually promoting academic success and achievements.

Statement of the Purpose

The purpose of this study was to investigate the influence of an introductory computer course on online instruction self-efficacy. This was accomplished by assessing the online instruction self-efficacy beliefs of undergraduate students of the College of Human Ecology, the University of Tennessee at the beginning and at the end of the Microcomputer Applications course. Additionally, the study investigated subjects' online instruction self-efficacy beliefs upon completing the course and their relation to learners' characteristics including gender, age, formal computer training, computer experience, online instruction experience, and Internet experience.

Research Questions

The research focused on assessing the effect of a basic computer competencies course on online instruction self-efficacy beliefs and relationship of online instruction self-efficacy to learners' characteristics. Therefore, the research questions were posited as follows:

1. Is there a significant difference in online instruction self-efficacy of undergraduate students as measured by the Tennessee Online Instruction Scale (TOIS) at the beginning and at the end of an introductory computer course?

2. Do online instruction self-efficacy beliefs at the end of an introductory computer course differ significantly for the demographic variables of gender, age, formal computer training, computer experience, online instruction experience, and Internet experience?

Hypotheses

Seven research hypotheses were developed to answer the research questions.

H_O1: There is no significant difference in online instruction self-efficacy beliefs as measured by the TOIS among test subjects at the beginning and at the end of an introductory computer course.

H_O2: There is no significant difference in posttest online instruction self-efficacy beliefs regarding gender as measured by the TOIS among subjects.

H_O3: There is no significant difference in posttest online instruction self-efficacy beliefs regarding age as measured by the TOIS among subjects.

H_O4: There is no significant relationship between posttest online instruction self-efficacy beliefs and extent of formal computer training as measured by the TOIS among subjects.

H_O5: There is no significant relationship between posttest online instruction self-efficacy beliefs and extent of computer experience as measured by the TOIS among subjects.

H_O6: There is no significant relationship between posttest online instruction self-efficacy beliefs and extent of online instruction experience as measured by the TOIS among subjects.

H_O7: There is no significant relationship between posttest online instruction self-efficacy beliefs and extent of Internet experience as measured by the TOIS among subjects.

Limitations

1. The population of the study was limited to the undergraduate students enrolled in the College of Human Ecology of the University of Tennessee in spring and summer 2002.
2. The subjects of the study composed a mostly homogeneous group regarding age and gender.
3. Responses collected from subjects were limited by the accuracy of their perceptions and beliefs.
4. In the investigation of the effect of computer training on online instruction self-efficacy, such variables as type of instructor, methods of instruction, and length of the course were not controlled.
5. Due to time limits and difficulty of finding the appropriate subjects, the research design did not include a control group.
6. The instrument of the study used a 7-point Likert scale to measure non-parametric data for demographic variables. The definitions of points ranging from "very low" to "average" to "very high" might have hindered the descriptiveness of the scale. In its turn, imprecise scaling may have distorted the distribution of responses on the scale.

Delimitations

1. The results of the study may be generalized to the undergraduate student population of the former College of Human Ecology of the University of Tennessee.
2. The study was delimited by Randall and Petty's Tennessee Online Instruction Scale (Randall, 2001) that was validated and tested with a sample of 762 participants and was found to successfully measure online instruction self-efficacy for that population.
3. The study was delimited by a non-randomized pretest-posttest experimental research design.
4. The sample size was maximized by distributing the research instrument among all undergraduate students enrolled in the introductory computer course in spring and summer 2002.
5. The sample size was maximized by a personal control of the researcher over the data collection.

Definition of Terms

1. **Causal attribution**: attributing failures or success to different factors, such as insufficient efforts, adverse situational conditions, or low ability (Bandura, 1995).
2. **Computer self-efficacy**: individuals' belief of their capability to perform a specific computer task (Karsten & Roth, 1998).

3. **Computer training**: instruction provided for the purpose of enhancing an individual's ability to use computers for learning and functioning (Decker, 1996).
4. **Distance education**: learning and teaching activities which occur when learners and instructors are separated at a distance.
5. **Forethought:** setting goals and anticipating the likely consequencies of prospective actions (Bandura, 2001).
6. **Intentionality**: proactive commitment to bring about a future course of action to be performed (Bandura, 2001).
7. **Online instruction**: Instruction delivered completely through the Internet or Intranet (Duchastel, 2001).
8. **Online instruction self-efficacy**: self-appraisal of one's capabilities to participate in online instruction, that is to perform instructional tasks that involve collaborative and individual learning activities over the Internet and World Wide Web (Randall, 2001).
9. **Outcome expectancy**: a belief that a given course of behavior will produce certain outcome (Bandura, 1995).
10. **Self-efficacy**: people's judgements of their capabilities to organize and execute courses of action required to attain designated types of performances (Bandura, 1986).
11. **Self-regulation**: behavior motivated and regulated by internal standards and self-evaluative reactions to people's own actions (Bandura, 1986).

12. **Self-reactiveness**: ability to give shape to appropriate courses of action and to motivate and regulate their execution (Bandura, 2001).
13. **Social cognitive theory**: theory that explains human functioning through the model of mutual interactivity of behavior, personal factors, and environmental events (Bandura, 1986).
14. **Web-based instruction**: a hypermedia-based instructional program which utilizes the attributes and resources of the World Wide Web to create a meaningful learning environment (Khan, 1997).

Summary

The first chapter presented the rational and need to investigate the effect of an introductory computer course on online instruction self-efficacy and relationship of online instruction self-efficacy to learners' characteristics. Additionally, this chapter outlined the theoretical framework of the research, discussed the problem of the study, and stated the research questions and hypotheses. A theoretical model of the study based on the social cognitive theory was provided. The chapter also included limitations, delimitations of this study, and definitions of terms.

CHAPTER II

Review of Literature

Overview of Chapter II

This chapter reviews the fundamental concepts and research related to online instruction self-efficacy. Basic concepts of social cognitive theory are introduced. They are followed by the review of self-efficacy theory and research. Due to the novelty of online instruction as a domain of self-efficacy and scarcity of its measuring instruments, the topic of self-efficacy assessment is addressed. As a better explored topic related to online instruction self-efficacy, computer self-efficacy is reviewed. The research on the relationship between computer self-efficacy, computer training, and other demographic variables is presented. Research studies on self-efficacy related to online instruction conclude the chapter.

Social Cognitive Theory

The primary purpose of this study is to investigate the impact of an introductory computer course on online instruction self-efficacy beliefs. Because self-efficacy construct is an important element of the social cognitive theory (Bandura, 1977, 1986, 1997, 1999, 2001; Schunk, 2000), this section reviews the basic concepts of the theory.

Pervin and John (2001) summarized distinguishing features of social cognitive theory as follows:

1. Emphasis on people as active agents.
2. Emphasis on social origins of behavior.
3. Emphasis on cognitive processes.
4. Emphasis on behavior as situation-specific.

5. Emphasis on systematic research.
6. Emphasis on the learning of complex patterns of behavior in the absence of rewards. (p. 439).

The social cognitive theory suggests that human functioning can be explained with "a model of triadic reciprocality in which behavior, cognitive and other personal factors, and environmental events all operate as interacting determinants of each other" (Bandura, 1986, p. 18). Individuals are viewed both as products and producers of their own environments and social systems. Figure 2 shows the model of triadic reciprocality.

Personal factors in the form of cognition, affect, and biological events, as well as behavior and environmental influences create interactions that Bandura (1986) commented on as follows:

> In this triadic reciprocal determinism, the term *reciprocal* refers to the mutual action between causal factors. The term determinism is used here to signify the production of effects by certain factors, rather than in doctrinal sense of actions being completely determined by a prior sequence of causes operating independently of the individual. Many factors are often needed to create a given effect. Because of multiplicity of interacting influences, the same factor can be a part of different blends of conditions that have different effects. Particular factors are, therefore, associated with effects probabilistically rather than inevitably. (p. 23)

In academic setting, the reciprocal determinism in human behavior makes it possible to direct interventions at either personal, or environmental, or behavioral factors (Pajares, 1997). In higher education programs, for example, instructional strategies can involve

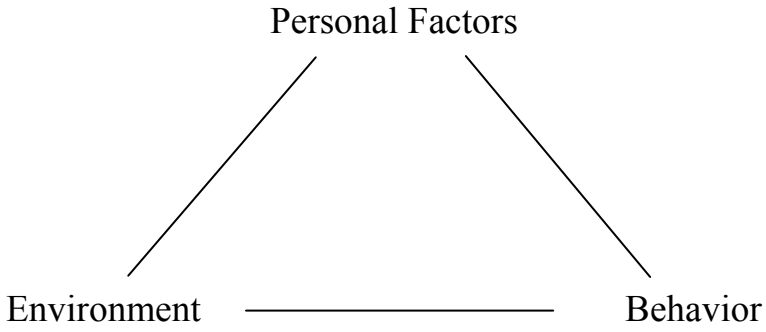

Figure 2. Model of triadic reciprocality (Adapted from Bandura, 1986)

improving academic learning to increase students' confidence in their academic abilities. Conversely, strategies aimed at raising students' confidence in their abilities will result in better academic performance. Using the model of triadic reciprocality, instructors can work to improve their students' emotional states and self-beliefs of their abilities (personal factors), to improve their academic skills and learning practices (behavior), and to create the academic curriculum and classroom procedures that encourage students' academic success (environmental factors).

Bandura's view of people as 'agents of experiences' (2001) emphasized the generative, creative, proactive, and reflective nature of the human mind. He argued that cognitive factors are critical in predicting human behavior and conducting effective interventions. To succeed, "people have to make good judgements about their capabilities, anticipate the probable effects of different events and courses of action, size up sociocultural opportunities and constrains, and regulate their behavior accordingly" (p. 3). Intentionality, forethought, self-reactiveness, and self-reflectiveness are core features

of human agency. Bandura emphasized the centrality of human agency's self-reflectiveness, a metacognitive ability of people to reflect upon their thoughts and actions that control their lives and environment.

Self-Efficacy Theory and Research

Self-efficacy theory

Self-efficacy is a central concept in social cognitive theory (Bandura, 1986, 1997, 2001; Maddux, 1995) because self-perceptions of efficacy influence behavior not only by themselves, but they also serve as mediators through influence on other determinants of behavioral changes. Bandura (1986) defined self-efficacy as "people's judgements of their capabilities to organize and execute courses of action required to attain designated types of performances" (p. 391). Self-efficacy refers to judgements people make about their abilities to do a specific task or act in a specific situation. Thus, perceived self-efficacy relates to specific domains of activity.

Social cognitive theory and research (Bandura, 1986, 1997; Hackett, 1995; Pajares, 1997; Pervin & John, 2001; Pintrich & Schunk, 1995; Zimmerman, 1995) posit that self-efficacy judgements influence the choice of activities, degree of effort, period of persistence, emotion, and performance. People that believe in their capabilities to do a particular task choose more challenging goals, apply more efforts, persevere longer when faced with difficulties, take changes as opportunities, and eventually perform better. Social cognitive theorists inferred interactivity of self-efficacy. For example, it was suggested that there is a reciprocal relationship between an individual's performance and his or her self-efficacy beliefs. On the one hand, improved performance increases self-efficacy; on the other, self-efficacy affects performance (Pajares, 1996).

Bandura (1995) identified four major processes through which self-efficacy beliefs regulate human functioning: (1) cognitive, (2) motivational, (3) affective, and (4) selection processes. Self-efficacy affects thinking patterns. For example, Bandura stated that those who consider themselves capable of decision-making are highly analytical even in complex situations. Self-efficacy beliefs contribute to motivation through causal attribution, outcome expectancies, and perceived goals. Self-efficacy may influence affective states. People who do not believe that they can cope with a threatening or difficult situation experience more stress and anxiety compared to those with higher coping self-efficacy. Finally, self-judgements of personal efficacy can determine the types of activities and environments in which people choose to be involved.

Social cognitive theorists identified four sources of information on self-efficacy including (1) mastery experiences, (2) vicarious learning experiences, (3) verbal persuasion, and (4) physiological state (Bandura, 1986, 1997; Maddux, 1995; Schunk, 1991). Information from the four sources is processed by a person to create a self-judgement of capabilities in a particular task.

Mastery experience (performance attainment) is emphasized as the most influential source of self-efficacy information for two reasons: it is based on direct, personal experience and is attributed to a person's own effort and skills (Pajares, 1996). Achieving success in a particular task provides an individual with cues about available capabilities. According to Pajares, to increase students' achievements, educational efforts should focus on altering students' beliefs of their self-worth or competence. Social cognitive theorists suggest that interventions should be designed with the focus on increasing confidence primarily through authentic mastery experiences. For example,

increasing computer competence would improve confidence in computer-related tasks, which would lead to increasing students' achievements in the areas requiring computer use.

Although vicarious learning is a weaker source of self-efficacy, it can produce significant and enduring changes on performance (Bandura, 1986). Observing other similar students' behavior, capabilities, and consequences of their behavior can affect self-efficacy beliefs of those who have the capabilities to master comparative skills but have little awareness of their capabilities. Therefore, the self-efficacy of individuals may be boosted by watching people with comparable capabilities that struggled to succeed and demonstrated good coping techniques in similar situations.

Educational interventions enhance self-efficacy beliefs mostly through verbal persuasion methods (Pajares, 1996). However, it is considered a less influential source of increased self-efficacy compared to mastery experiences and vicarious experiences (Maddux, 1995). Bandura (1995) noted, "It is more difficult to instill high beliefs of personal efficacy by social persuasion alone than to undermine them" (p. 4). Expertness, trustworthiness, and attractiveness of the source are factors in the degree of influence of verbal persuasion.

Physiological and emotional states can also influence self-efficacy. People experiencing physical debility are more likely to have lower self-efficacy. They see physical or emotional conditions as affecting their capabilities. Mood can also affect self-efficacy judgements. Bandura (1995) suggested that self-efficacy beliefs can be increased by improving physical status, reducing stress or negative emotions, and interpretation of the bodily states.

Once attained in one task situation, self-efficacy may generalize to other situations especially to activities similar to those in which self-efficacy was enhanced (Bandura, 1986, 1997). Understanding the conditions under which self-beliefs can generalize to different activities may offer opportunities for instructional interventions and techniques (Pajares, 1996). Bandura (1997) identified a number of such conditions including similarity of skills for different tasks, co-development of different activities, reduced stress, commonalties among activities, and transforming experiences.

Related self-efficacy research

Meta-analytical studies by Holden, Moncher, Schinke, and Barker (1990), Multon, Brown, and Lent (1991), and Stajkovic and Luthans (1998) attested to the role of self-efficacy in human functioning. Self-efficacy received increased attention in educational research, primarily in studies of academic performance, motivation and self-regulation. Pajares (1997) identified three major directions of educational research on self-efficacy: (1) efficacy beliefs and career and major choices; (2) instructors' efficacy beliefs and instructional practices; and (3) students' self-efficacy and its relation to motivation, academic performance and achievement.

Self-efficacy has been found to be useful in understanding behavior in a diverse variety of academic situations (Zimmerman, 1995). Research has documented the role of an individual's level of self-efficacy for a particular task in predicting task performance and persistence in educational settings. A meta-analytic review of 39 educational studies indicated that self-efficacy was strongly related to student persistence and performance in a variety of subject areas, experimental designs, and levels of education (Multon et al., 1991). Interestingly, when perceived academic efficacy was raised by mastery

experience, instructional modeling, and supportive feedback, posttest self-efficacy beliefs were best predictors of performance.

Another, more recent meta-analytical study (Stajkovic and Luthans, 1998) demonstrated that self-efficacy was positively and strongly related to performance. The study examined 114 studies on self-efficacy and work-related performance. The researchers found that a 28% gain in performance was due to increased self-efficacy. The findings also indicated that the relationship between self-efficacy and performance was moderated by task complexity and situational factors such as ability conception and skill acquisition.

Tuckman and Sexton's study (1992) showed that individuals with low self-efficacy pursued lower levels of performance. Students' lack of confidence in their abilities during task performance undermined their perseverance. They gave up easily when faced with a difficult task. This process adversely affected the development of actual ability, which resulted in lower performance.

A study by Chemers, Hu, and Garcia (2001) of undergraduate students of the University of California, Santa Cruz examined the effects of academic self-efficacy on students' academic performance, stress, and commitment to remain in school. Academic self-efficacy was found to strongly relate to performance, both directly on academic performance and indirectly through expectations and coping perceptions on classroom performance, stress, health, and overall satisfaction.

Bandura (1997) argued that self-efficacy can affect performance through cognitive processes, such as self-appraisal or performance feedback. Studies showed that students who were higher in decision-making self-efficacy, used more often better

analytic strategies for improving performance (Wood & Bandura, 1989). Self-efficacy acts on a broader level through the more effective use of metacognitive strategies that involve planning and self-regulation.

Vrugt, Langereis, and Hoogstraten (1997) reported two studies that tested the effect of academic self-efficacy and personal goals of psychology freshmen on exam performance. In the first study, they found evidence that academic self-efficacy contributed to exam performance directly and indirectly through pursued goals. The second study showed that participants with high self-efficacy beliefs ascribed failures less to lack of talent than those with low self-efficacy appraisals did. The difference occurred between participants with high and low intelligence. Differences between exam scores occurred only in the high-intelligence group. The exam performance of the participants with high self-efficacy was better than that of the participants with low self-efficacy beliefs.

Research (Lent, Brown, & Hackett, 1994) documented the relationship between self-efficacy and personal choice. Evidences were provided that mathematics self-efficacy of college undergraduates is more predictive of their mathematical interest and choice of courses than their prior math achievements or math outcome expectations. Perceived self-efficacy has been found to predict an individual's choice of a web-based course (Wang & Newlin, 2002) as well as career and academic options and subsequent persistence and success in the chosen option (Lent, Lopez, & Bieschke, 1991).

Self-efficacy impacts affective processes through its effect on the perception of environmental demands or on the ability to control and manage negative emotions (Bandura, 1997). Research (Chemers et al., 2001) showed that people with higher self-

efficacy are less likely to be affected by anxiety and pessimism. Highly optimistic students tended to be more efficacious.

Self-efficacy assessment

Self-efficacy is measured along three dimensions: magnitude, strength, and generality. Maddux (1995) identified them as follows:

> Magnitude of self-efficacy, in a hierarchy of behaviors, refers to the number of 'steps' of increasing difficulty or threat to a person who believes himself capable of performing. …Strength of self-efficacy expectancy refers to the resoluteness of a person's convictions that he or she can perform a behavior in question. …Generality of self-efficacy expectancy refers to the extent to which success or failure experiences influence self-efficacy expectancies in a limited, behaviorally specific manner, or whether changes in self-efficacy expectancy extend to other similar behaviors and contexts. (p. 9)

Bandura (1986) emphasized a microanalytic research strategy in assessing self-efficacy beliefs. He wrote, "A special merit of the microanalytic approach is that particularized indices of self-efficacy provide refined predictions of human actions and affective reactivity" (p. 422). Social cognitive theory suggests that people's self-conceptions and self-processes are task and situation-specific (Bandura, 1986; Pintrich & Schunk, 1995). Beliefs concerning individuals' abilities to handle tasks and challenges presented by particular kinds of situations involve cognitive processes such as categorization of situations, anticipation of the future, and self-reflection (Pervin & John, 2001). As a result, people's behavior patterns in accordance with their perceptions of different situations.

Bandura (1986) argued that self-efficacy beliefs assessment should follow the guidelines of domain specificity and correspondence. That is, self-efficacy scale items should correspond to the criterial task and the domain of functioning. Thus, precise judgements of capabilities matched to a specific situation afford the greatest prediction and offer the best explanations of behavioral or cognitive processes. Multon et al.'s meta-analysis (1991) of studies on self-efficacy and academic performance showed that the strongest correlation was found when researchers followed the guidelines of specificity and correspondence in assessing self-efficacy, and the instrument closely matched the performance task.

Computer Self-Efficacy

This section includes recent research on computer self-efficacy. With the growing role of computer technology in higher education, students' negative beliefs and attitudes can hinder its effective employment (Bandura, 2001). Campbell and Lee (1988) stated that learning may be constrained within an individual and within the situation. In computer-enhanced learning, such constraint may be low computer self-efficacy. For individuals to enjoy the benefits of computer technologies, they need to be confident in their abilities to use them.

In a study of college students, Hill, Smith, and Mann (1987) provided evidence that computer self-efficacy might be a determinant of computer use. Moreover, computer self-efficacy was found a significant factor in technology adoption whereas previous experience with computers was not found to influence the decision to learn about computers. Kennedy (1993) conducted a study to test whether computer self-efficacy was related to the adoption of computers for instruction. The researcher provided evidence

that self-efficacy rose as educators adapted and learned using new educational technologies.

Research demonstrated that perceived self-efficacy and attitudes toward computers are predictive of students' performance in a computer class and on computer-mediated tests. Coffin and MacIntyre (1999) investigated the effect of computer self-efficacy on academic performance in computer classes. Participants included 111 undergraduate students enrolled in introductory programming and computer fundamental courses. It was found that as perceived self-efficacy strengthened, academic performance improved. The results also showed that students who had high perceptions of task value in learning to use computers were more likely to have an intrinsic goal orientation. Those two factors led to reduced computer-related anxiety, increased computer-related self-efficacy, and ultimately higher grades in computer classes. A strong correlation between self-efficacy for learning and computer-related self-efficacy was also found.

Decker's research (1996) examined computer self-efficacy as a transfer of computer training factor. Among predictors of computer self-efficacy, the researcher found evidence for previous classroom computer training, computer use required on the job, frequency of computer use, and job type. She also concluded that computer self-efficacy and self-efficacy of computer technologies sustained over the 2.5-year period of computer training.

Gelberg (1990) conducted a study on computer anxiety and self-efficacy in which variables of vocational/personality type, gender, previous experience, computer self-efficacy, and math anxiety were independent measures. Negative correlation was found between computer self-efficacy and computer anxiety. The analysis allowed the

researcher to conclude that self-efficacy, vocational interests, and math anxiety were significantly correlated with computer anxiety, with computer self-efficacy being the most significant predictor of computer anxiety.

The effect of computer training on computer self-efficacy

Basic computer training provides the four sources of information for computer self-efficacy specified by Bandura (1986). Karsten and Roth (1998) identified mastery experiences and vicarious learning as most influential on computer self-efficacy. Students' computer competence increases along regular learning activities. Overcoming difficulties that students come across during the training provides them with cues of their improved capability to perform a computer-related task. A traditional computer introductory course also offers opportunities to observe successes and failures of other students who came to the class with a similar level of skills. Additionally, an instructor serves as a model of successful computer-related behavior.

Social persuasion and affective states can also influence computer self-efficacy. Verbal persuasion via the encouragement and support of an instructor and peer students affects students' confidence in computer-enhanced learning. Helping a student overcome fears and fostering positive attitudes during a computer course reduce stress and anxiety, thus leading to improved computer self-efficacy. Exposure to computers in a learning environment also reduces computer anxiety.

Research established the significant effect of computer training on computer self-efficacy. Smith (1994) explored the effect of a standard classroom instruction in an introductory computer science course on task-specific and generalized self-efficacy using a sample of university students. One of the groups received additional treatment of verbal

persuasion. The researcher used pre and post-test research design with a control group. Significant increases in task-specific self-efficacy were found. In generalized computer self-efficacy beliefs, significant gain was revealed only for females.

Torkzadeh and Koufteros (1994) examined the effect of computer training on computer self-efficacy. In their study, 224 students were administered a computer self-efficacy survey at the beginning and at the end of an introductory computer course that employed both lectures and laboratory instruction. Pre and post-test data revealed significant increases in student computer self-efficacy for all four factors of beginning computer skills, mainframe skills, advanced computer skills, and file and software skills. For pre-training, gender difference in mean scores was significant for one factor, computer file and software management. For post-training, no significant gender difference was found for any of the factors. For each factor, the results indicated a significant increase in self-efficacy scores for both males and females.

Ertmer and Schunk (1997) reported a study with 44 college students enrolled in an introductory computer course. Students completed pre and post-test measures that assessed their skills and self-efficacy for HyperCard tasks and self-regulatory strategies. Students were assigned to the conditions of learning and performance goals with and without self-evaluation. Significant and positive correlation was revealed between perceived competency and self-efficacy. The researcher suggested that combining goals with self-evaluation of progress in learning was an effective way to raise college students' self-efficacy during computer skills learning.

Smith-Weber (1999) conducted a study of 194 students enrolled in an introductory computer course at a large university. The students were administered a

survey that measured perceived sources of computer self-efficacy. Mastery experience indicated the highest level of computer self-efficacy with a reported mean score of 4.2 on a 5-point Likert scale. Interestingly, the score of 4.1 signified affective states as a second major source of computer-self-efficacy.

Karsten and Roth's study (1998) of 98 undergraduate students examined the relationship among computer experience, computer self-efficacy, and performance in an introductory computer course typical for a business school. A questionnaire was administered prior to computer training and on the last day of the course. Three measures of computer experience, total years of computer experience, average computer use per week, and the number of prior computer courses were introduced. The researchers reported that students' perceptions of their computer capabilities were improved during the course. There was a significant difference in pre-course (M=118.73) and post-course (M=153.60) computer self-efficacy. All three measures of computer experience were significantly and positively correlated with pre-course computer self-efficacy. Pre-course computer self-efficacy was significantly related to performance. None of the measures of computer experience was significantly related to performance.

Karsten and Roth's findings suggest that computer training enhanced students' computer self-efficacy. The researchers suggested that only relevant computer experiences might have had an impact on the course performance. Although they found a significant relationship between student perceptions of computer literacy and course performance, it was not particularly strong. Karsten and Roth concluded that even with adequate initial computer skills, an introductory computer course might encourage skills integration and refinement that contribute to future computer-related success.

Larson and Smith (1994) evaluated computer competency of 444 freshmen college students and examined factors affecting attitudes toward computers. Nearly 61 percent of high computer-experience users avoided courses requiring computer use. Level of computer use confidence decreased as computer experience increased. The researchers suggested that mandatory introductory computer courses for incoming college students could help them improve computer competence and build confidence in computer use in college. They also suggested that course designers address computer anxiety issues.

Salanova, Grou, Cifre, and Llorens (2000) conducted a study of 140 workers using computer technology in their jobs. The subjects completed a set of self-report questionnaires that measured frequency of computer usage and computer training, computer self-efficacy, and burnout. Multiple regression analysis was performed to test the correlation of computer training and computer self-efficacy. It was found that frequency of computer usage and computer training was positively associated with computer self-efficacy when controlled for age. Additionally, the findings showed that there was an interaction effect between computer training and computer self-efficacy on levels of burnout. Workers with low computer self-efficacy had an increased level of burnout when computer training was high. Thus, the study showed that computer self-efficacy acted as a stress buffer when possible burnout resulted from computer training.

Schunk and Ertmer (1998) reported two studies on students in an undergraduate teacher education program enrolled in an introductory computer course. Students were pre-tested and post-tested during a unit of the course. The study examined the influence of learning goals and self-evaluation on student achievement outcomes. The testing

included measures of self-efficacy, self-regulation, and achievement. The results found that providing students with learning goals improved their self-efficacy for successfully performing computer based tasks better than did providing performance goals. Opportunities for self-evaluation also significantly affected self-efficacy. Regardless of treatment condition, self-efficacy had a strong positive relation to achievement.

Another study (Chou, 2001) investigated the effect of different training approaches on computer self-efficacy. Two training methods were considered by the researcher: instruction-based and behavior-modeling. Instruction-based class taught primarily by lectures and followed a deductive way of learning. Behavior-based method involved observing a model and extending the model's behavior in practice and experimentation. The results of the study indicated that behavior-modeling training method yielded consistently higher computer self-efficacy compared to instruction-based training approach.

Potosky (2002) conducted a study of 56 newly hired computer programmers at a software development firm who participated in a four-day programming training course. The relationship between post-training task-specific (programming) self-efficacy and computer knowledge and experience were examined. Additionally, training performance as a source of task-specific self-efficacy was explored. A significant correlation between computer self-efficacy and post-training task-specific, programming self-efficacy was found. Performance during training and prior computer knowledge were significantly related to post-training task-specific self-efficacy.

Individual differences and computer-related self-efficacy

Broad diversity of learners' differences calls for considering individual characteristics of students in computer-enhanced instruction. With awareness of personal characteristics of individuals, educators or trainers can develop programs more suitable for diverse audiences. Literature and research on individual differences and computer-related self-efficacy will follow.

Gender

The research literature reviewed produced mixed findings on the relationship of gender and self-efficacy. A meta-analysis of studies on gender differences in computer-related attitudes and behavior (Whitley, 1997) reported statistically significant gender differences of computer self-efficacy between males and females. The effect sizes were higher for adults and high school students and lower for college students. Rozell (1992) found a relationship between computer self-efficacy and gender. Torkzadeh and Koufteros' study (1994) found significant gender difference for pre-training self-efficacy in computer file and software management. No gender differences were revealed in the post-training self-efficacy. The analysis of post-training data showed a significant increase in self-efficacy scores for both male and females. Smith-Weber's study (1999) found significant gender differences regarding four sources of computer self-efficacy. Mastery experience, vicarious learning and social persuasion scale means were significantly higher for females than males.

A study by Chou (2001) evidenced significant gender differences in computer self-efficacy and combined effects of gender and training method on computer self-efficacy. Coffin and MacIntyre's study (1999) found gender differences in levels of the

computer-related self-efficacy. Specifically, males had higher perceptions of computer-related self-efficacy.

Schumacher & Morahan-Martin (2001) reported gender differences of college freshmen in levels of computer and Internet use confidence, with males scoring higher than females. A few studies found no gender differences on computer self-efficacy (Henry & Stone, 1999; Karsten & Roth, 1998; Smith, 1994). Ren (2000) also did not find correlation between self-efficacy in electronic information searching and gender.

Age

Laier (1994) investigated the effectiveness of computer training program among younger and older adults. Computer self-efficacy was measured at the beginning and at the end of training. The study found evidences to the gender and age effects on the variables. Kandies (1995) investigated the relationship of electronic mail use to self-efficacy. The survey of 500 faculty members showed that age mediated an effect of self-efficacy on the use of e-mail. In her study of undergraduate students enrolled in online courses, Wiggins (2000) found a statistically significant positive correlation between grade achievement, self-efficacy and age. Smith-Weber (1999) found a significant correlation between social persuasion as a source of computer self-efficacy and age. No significant relationship between mastery experiences, vicarious learning, and affective states was revealed. Ren's (2000) study found that self-efficacy was not correlated with individual background of age.

Computer experience

Prior computer experience was found to be positively correlated with computer self-efficacy (Ertmer, Evenbeck, Cennamo, & Lehman, 1994; Hill et al., 1987; Robertson

& Stanforth, 1999; Schumacher & Morahan-Martin, 2001). Rozell's research (1992) indicated that there was a relationship between computer self-efficacy, computer experience, computer anxiety, and academic achievement on computer performance. Levin and Donitsa-Schmidt (1998) found a positive relationship between computer use and computer self-efficacy. Randall (2001) found computer experience to be related to online instruction self-efficacy.

Coffin and MacIntyre (1999) also investigated the effects of previous experience with computers on computer self-efficacy. Their results showed that previous experience with computers was a significant factor in determining students' computer-related self-efficacy. More specifically, as students gained more experience with computers, their perceptions of computer-related self-efficacy increased. However, a study by Karsten & Roth (1998) did not find a significant relationship of computer experience with posttest computer self-efficacy.

Internet and online instruction experience

A few studies on the relationship of computer-related self-efficacy and Internet and online instruction experience were revealed. Ren's study (2000) found that prior Internet experience and frequency of Internet use were significantly and positively correlated with pre-training and post-training self-efficacy for electronic information search. A dissertation study by Randall (2001) found evidence that computer online instruction learning experience and Internet experience were related to online instruction self-efficacy beliefs. Lim (2000) reported that Internet experience in class and number of courses using the Internet were found to be significantly related to computer self-efficacy.

Online instruction

The computerization of the American society and growing demand for continuing and distance education brought about rapid advances of instructional technology both in higher education and corporate training (Molenda & Sullivan, 2000). In the post-secondary education, the most visible trend is the expansion of virtual instruction. A 1998 survey (Campus Computing Project, 1998) indicated rapid increase in Internet-related uses in college courses.

Accessibility, flexibility, infinite resources, opportunities for students to become active participants in their own learning, encouraged self-motivation and student inquiry, and easy assessment and evaluation process make online instruction attractive for adult learners (Huang, 1997). However, Duchastel (1997) warned about motivational challenges learners face in online instruction. He argued that motivation became more and more central to web-based learning as full potential of computer-based instruction is realized. Duchastel discussed the Keller's (1983) model of instructional design that considered four factors in motivation to learn: attention, relevance, confidence, and satisfaction. He argued that confidence and satisfaction are less controlled in web-based instruction and therefore should be particularly addressed by designers of online university courses.

The integration of computer technologies in the instructional design impact students' abilities to utilize them for interaction in an online course. Geer (2000) identified student confidence with computer technology and prior computer knowledge as a driver of collaborative interactivity in an online course. She suggested that adequate

training in computer technologies should enhance collaborative interactivity during the online course.

Rossett and Sheldon (2001) offered design and development guidelines for online instruction. They included enhanced student's confidence as a component of an effective online program design. They suggested a number of strategies to boost confidence in online learning, such as relating the subject to students' prior experience and knowledge, ensuring early success with the material, avoiding discouraging pre-tests, and offering coaching.

Hacker and Niederhauser (2000) identified principles of instruction that would promote self-efficacy and perceived challenge in an online course. They argued that encouraging students to independently construct knowledge while using various communication tools in online instruction would help students build their self-efficacy. Another suggestion was to let students select problems on their own. Collaborative problem solving that would allow students to view their problems in comparison with others was another recommended instructional principle. Finally, they suggested that feedback should be designed to promote self-efficacy. The authors advised avoiding direct negative feedback, judicious use of praise for success, and minimizing failures by sharing responsibilities among students.

Relan (1992) proposed strategies in computer-based instruction strengthened by cognitive and social motivational influences. She argued that computer-based instruction must serve to improve learners' expectations of success and enhance feelings of self-efficacy. The author offered interventions designed to improve self-efficacy including feedback based on past successes due to efforts, ability feedback, proximal goal setting,

and peer modeling. According to the author, computer-based instruction should emphasize peer modeling in improving self-efficacy via cooperative learning. She also suggested that proximal goal-setting and ability feedback based on past successes could be powerful mediators in improving self-efficacy, leading to increased persistence in computer-related performance.

Internet provides vast opportunities and an easy access for learning. However, it is important for the learner to possess a certain level of computer competence and adequate self-efficacy beliefs in order to take an online course. Challenges associated with online instruction can turn off adult learners from an online course or impede the learning process. The review of research on self-efficacy related to online instruction follows.

Research on self-efficacy related to online instruction

A report by the Institute for Higher Education Policy (IHEP) reviewing the research on distance education noted that research on online instruction is far behind the explosive growth of education and training delivered online (IHEP, 1999). Studies on self-efficacy in online instruction are particularly scarce. Joo et al. (2000) conducted a study investigating the effect of self-efficacy on learners' performance in online instruction. Their findings let them suggest that computer self-efficacy was one of the critical factors to determine the learner's success in online instruction. The review of related research literature on self-efficacy and its relation to online instruction follows.

Reinhart (1999) investigated a relationship between students' self-efficacy for web-based instruction, motivation to learn from web-based instruction, and task difficulty. Sixty-three undergraduate education majors participated in the study. The participants were grouped by the level of their self-efficacy for web-based instruction and

randomly assigned to three instructional tasks varying by difficulty. Reinhart found a significant positive relationship between self-efficacy and motivation variables. Reinhart also reported a significant relationship between motivation to learn from web-based instruction and self-efficacy beliefs for learning from web-based instruction. The results also showed a significant correlation between self-efficacy and control of learning.

Miltiadou and Yu (2000) developed and validated the Online Technologies Self-efficacy Scale, an instrument that measured online students' self-efficacy beliefs with communication technologies in an online class, such as email, Internet, and computer conferencing. About 330 college students enrolled in online courses participated in the study. Miltiadou and Yu investigated the relationship of motivational constructs and academic success of students enrolled in an online course. Self-efficacy with online technologies was found a significant predictor of students' achievement in the online course. Self-efficacy also was a significant predictor of whether students completed or dropped the course.

In his dissertation study, Randall (2001) developed a theoretical model of the online instruction self-efficacy. Based on the model, he presented the Tennessee Online Instruction Scale designed to measure online instruction self-efficacy. The instrument was tested with a sample of 762 electrician instructors from the National Joint Apprenticeship Training Committee. Randall identified three factors of online instruction self-efficacy: Internet/technology behaviors, collaborative behaviors, and individual behaviors. The researcher also examined relationship between demographic variables and self-efficacy beliefs. Level of computer experience was found to be significantly related to online instruction self-efficacy for Internet/technology behaviors and individual

behaviors. Online instruction learning experience was significantly related to self-efficacy beliefs on collaborative behaviors. Finally, Internet experience showed to be significantly related to online instruction self-efficacy for Internet/technology and collaborative behaviors.

Joo et al. (2000) examined effects of students' self-efficacy on performance in Web-based instruction. High school students in Seoul, Korea, participated in Web-based instruction during regular science classes. Students' Internet self-efficacy was assessed at the beginning of the course. At the end of Web-based sessions, students took written and search tests. Students' performance in the Internet search test was significantly and positively correlated with Internet self-efficacy.

Lim (2000) developed a predictive model for satisfaction of adult learners enrolled in a web-based distance education course and intent to participate in other web-based distance education courses. The participants of the study were graduate and undergraduate students from four universities. A significant relationship between computer self-efficacy and satisfaction in a web-based course was found. The study also demonstrated that computer self-efficacy and computer training were significant predictors of participants' intent to take additional online courses. Multiple regression analysis was performed to develop a predictive model for computer self-efficacy. Computer training, participation in a workshop to prepare for a web-based course, intent to participate in such workshop, gender, frequency of computer use, age, Internet experience in class, number of courses using the Internet, and years of computer use were found to be significantly related to computer self-efficacy.

Hill and Hannafin (1997) found that learners' computer self-efficacy had a notable effect on their electronic information searching processes. Perceived self-efficacy affected both the number and types of strategies engaged. Participants who perceived medium to high self-efficacy applied more strategies and at higher levels than those with low self-efficacy. Another study (Kagima, 1998) identified computer self-efficacy and self-efficacy in using the World Wide Web to be a strong predictor of integration of electronic communication in instruction for college students.

A study by Lin (1999) investigated whether students' self-efficacy would enhance their commitment and achievement in an online class in Taiwan. The study also compared students' commitment, achievement, self-efficacy, and task value with and without a training workshop designed to increase students' achievement and commitment. The subjects were 30 students enrolled in a web-based education technology class. The results showed that the higher self-efficacy students held, the easier the task was perceived in an online course. Additionally, a training workshop had a positive impact on students' perceived self-efficacy. The researchers concluded that teaching students appropriate learning strategies and providing them with more practices might increase their self-efficacy. Another important conclusion was that training could contribute to students' self-efficacy.

Wang and Newlin (2002) conducted a study of 122 college students enrolled in web-based sections of a psychology course. They investigated students' personal choices for taking web-based courses and whether college students' self-efficacy for the course content and technological components would predict their performance in the online section of the class. They found that students who enrolled because they enjoyed web-

based learning environments had higher self-efficacy than students who enrolled solely because of course availability. Additionally, students' perceived self-efficacy beliefs regarding course content and technology skills necessary for the online course were predictive of their final exam scores in the course.

A study on Internet learners reported that students with lower self-efficacy in Internet use dropped out the Internet hands-on training program (Nahl, 1996). Small business executives who had higher Internet self-efficacy searched the Internet for government information more frequently than those who had relatively lower Internet self-efficacy (Ren, 1999). Another study by Ren (2000) showed that students' self-efficacy in electronic information searching was significantly higher after library instruction that included lecture, demonstration, hands-on practice, and a search assignment. The results of Cauble and Thurston's study (2000) of social work students indicated the increase of confidence in their ability to use skills and knowledge as the result of interactive multimedia training.

A study of 76 college students by Mylona (1998) examined the relation of students' self-efficacy for computer technologies and learning and their preference of the instructional method chosen. Three groups of students attended a course in humanities through three different modes of delivery: web-based, video-based, and conventional instruction. Results of the study showed that self-efficacy for computer technologies was a strong predictor of students' selection of the instructional method.

Hemphill (2001) reported her dissertation study in which she developed a learner profile instrument. The profile offered learners strategies for increasing their metacognitive and cognitive skills, academic motivation, required knowledge, and self-

efficacy in computer-based instruction. The prototype was tested at three different colleges to determine if there was a relationship between the use of the suggested learner strategies and the learners' achievement on the posttest. The study was conducted with 81 students taking software training courses. The findings revealed that there was a statistically significant difference between the achievement score percent of subjects who followed the learning strategies suggested in their learner profiles and of subjects who did not.

Summary of Literature Review

The review of related research and literature indicated the need to investigate the effect of basic computer training on online instruction self-efficacy and relationship between online instruction self-efficacy and learners' demographic variables. A brief summary of the literature review follows.

The emphasis of social cognitive theory on generative and reflective nature of human mind has significant implications for education and training. The concept of self-efficacy suggested by Bandura (1997) posits that people who believe in their capabilities to do a particular task choose more challenging goals, apply more efforts, cope better with difficulties, and perform better in a particular task.

With the growing role of computer technologies in education and training, computer self-efficacy received considerable attention of researchers. Empirical research provided evidence that computer self-efficacy was related to computer use, computer anxiety, and students' performance in computer classes (Coffin & MacIntyre, 1999; Gelberg, 1990; Hill et al., 1987). The effect of computer training on computer self-

efficacy was found to be significant in a number of research studies (Karsten & Roth, 1998; Smith, 1994; Torkzadeh & Koufteros, 1994).

The literature review revealed mixed findings on the relationship of the demographic variables of gender, age, and computer experience and computer self-efficacy. Computer training, Internet and online instruction experiences were found to be positively related to computer-related self-efficacy.

The integration of Internet in higher education and corporate training necessitated exploring self-efficacy in the domain of online instruction. Design and development guidelines for online instruction offered strategies and interventions to improve students' confidence in online learning (Geer, 2000; Hacker & Niederhauser, 2000; Relan, 1992; Rossett & Sheldon, 2001).

A number of studies on self-efficacy related to online instruction were reviewed (Hemphill, 2001; Joo et al., 2000; Kagima, 1998; Lim, 2000; Lin, 1999; Miltiadou & Yu, 2000; Nahl, 1996; Randall, 2001; Ren, 2000; Reinhart, 1999; Wang & Newlin, 2002). A significant relationship was found between self-efficacy and motivation to learn from web-based instruction, self-efficacy with online technologies and students' achievement in online course, online instruction self-efficacy and demographic variables of computer experience, online instruction experience, and Internet experience. No evidence was found in the reviewed research about the effect of computer training on online instruction self-efficacy. Further research on online instruction self-efficacy is needed to provide educators and instructional designers with guidelines for effective online instruction design and development.

CHAPTER III

Methodology

This study intended to investigate the influence of an introductory computer course on online instruction self-efficacy. Additionally, the study examined subjects' online instruction self-efficacy beliefs upon completing the computer course and their relation to learners' characteristics. The research methodology conforming to the purposes of this study is presented in this chapter. The chapter describes the research population and sample. Additionally, it details the research design and procedures, instrumentation, data collection, and research analysis.

Research Population and Sample

The population of the study consisted of undergraduate students of the College of Human Ecology enrolled in a college-wide introductory computer course, Microcomputer Applications in spring and summer 2002. The research population was selected based on its accessibility to the researcher. Form A, Certification for Exemption from IRB Review for Research Involving Human Subjects was submitted and permission to conduct the study was obtained from the University of Tennessee's Office of Research (see Appendix A). It should be noted that in fall 2002, the College of Human Ecology joined the College of Education to form a new college, the College of Education, Health, and Human Sciences.

Undergraduate students of the College of Human Ecology took the Microcomputer Applications course as a prerequisite for core courses. Therefore, most students had to take this course in their freshmen or sophomore years. The Microcomputer Applications course was designed to provide a basic level of competence

in using computers to communicate, acquire information, prepare documents, solve problems, utilize presentation graphics, and to introduce students to online learning. There was a procedure of course waiver for those students who demonstrated sufficient computer skills in the proficiency test administered on the first day of class.

The participants of this study were self-registered in different sections of the Microcomputer Applications course and were identified through enrollment rosters. There were seven sections of the Microcomputer Applications course in spring 2002 and two sections in summer 2002. The average number of students in each section in spring 2002 session was 15; the average number of students in two sections in summer 2002 session was 6.

This study used a purposive sampling method. The researcher approached personally the participants of the Microcomputer Applications course on the first day of the Microcomputer Applications class with the request to voluntarily participate in the study. All students who were enrolled in the Microcomputer Applications course and were present in their corresponding sections in the first and the last class of the course agreed to participate in the research. At the beginning of the course, 115 students completed the survey. At the end of the course, 95 students completed the survey. Matching pretest and posttest responses identified 92 subjects of the study who completed both pretest and posttest survey.

Research Design and Procedures

To examine the effect of an introductory computer course on online instruction self-efficacy, this research employed an experimental research design, nonrandomized pretest-posttest (Isaac & Michael, 1997). The population sample was given treatment, a

Microcomputer Applications course, and was surveyed at the beginning and at the end of the course.

The use of a control group was not feasible in the research for a number of reasons. First, the population sample included only those students who had not taken the Microcomputer Applications yet. That limited the subjects of this study to mainly freshmen and sophomores because most senior undergraduate students had already taken the course as a prerequisite. Second, the study took place in the spring and summer semesters when half of the freshmen and sophomores already took the course in fall. Therefore, it was difficult to find a control group of students who had not attended the course yet. Finally, the search for the subjects of the control group was constrained by the time limits of the study.

The research design procedures followed guidelines offered by Isaac and Michael (1997) for an experimental research design, nonrandomized pretest-posttest.

1. Subjects for the experimental group were selected by purposive method from the population of undergraduate students of the College of Human Ecology enrolled in Microcomputer Applications course in spring and summer 2002.
2. The subjects were pre-tested on the dependent variable of online instruction self-efficacy and on the independent variables of gender, age, formal computer training, computer experience, Internet experience, and online instruction experience using the Tennessee Online Instruction Scale (TOIS).
3. The subjects of the study were given treatment, the Microcomputer Applications course. Those students who were enrolled in spring 2002 semester participated in a 16-week, three-hour credit Microcomputer

Applications course. Those students who were enrolled in summer 2002 semester participated in a four-week three-hour credit Microcomputer Applications course in summer 2002. Six instructors were teaching nine sections of the course in spring and summer 2002 based on the identical curriculum. One of the summer 2002 sections of the course was taught by the researcher.

4. At the end of the course, the subjects were post-tested on the dependent variable of online instruction self-efficacy using the identical measuring instrument, the TOIS.
5. The difference between pretest and posttest online instruction self-efficacy means was determined for the research population.
6. The relationship between the dependent variable of posttest online instruction self-efficacy and the independent variables of gender, age, formal computer training, computer experience, Internet experience, and online instruction experience was determined for the research population.

Instrumentation

The research instrument employed in this study conformed to the purposes of the study. The objectives of this research were to measure the effect of computer competency acquired during an introduction computer course on online instruction self-efficacy as well as to investigate the significance of subjects' demographic variables in relation to online instruction self-efficacy.

The literature review revealed that studies on self-efficacy related to online instruction used different measuring instruments. Ren's study (2000) used an instrument

to measure confidence in performing tasks relating to the use of library electronic sources. Hargis (2001) used the Motivated Strategies for Learning Questionnaire to measure learners' self-regulation and self-efficacy in online learning. Other instruments found were The Online Technologies Self-Efficacy Scale (Miltiadou & Yu, 2000) and Internet Self-Efficacy Scale (Torkzadeh & Van Dyke, 2001). However, none of these instruments provided a valid measuring scale meeting the purpose of this research to measure online instruction self-efficacy. Most of the above instruments measure self-efficacy perceptions related only to the Internet or computer technology behaviors. However, the literature review suggested that online instruction self-efficacy includes also factors of collaborative behavior and individual behavior (Randall, 2001).

The review of related research revealed the Tennessee Online Instruction Scale (TOIS), an assessment of online instruction self-efficacy beliefs (see Appendix B). The TOIS is a survey instrument developed by Fredrick Randall and Gregory Petty based on a theoretical model of online instruction self-efficacy suggested by Randall in his dissertation study (2001). The exploratory factor analysis conducted by Randall allowed the researcher to identify three factors in online instruction self-efficacy: Internet/technology behaviors, collaborative behaviors, and individual behaviors. The TOIS was tested with a sample of 762 electrician instructors from the National Joint Apprenticeship Training Committee (NJATC) and was considered to adequately measure the construct of online instruction self-efficacy for that research population. During the consultation with the major research advisor, it was decided that the TOIS was an appropriate psychometric measuring tool for online instruction self-efficacy.

The TOIS consisted of two parts. Part One included a list of 40 online instruction tasks including Internet/technology behaviors, collaborative behaviors, and individual behaviors. Self-efficacy strength was measured using a 1-7 scale ranging from *Never* (1) to *Always* (7). Part Two contained background questions about subjects' demographic information.

With the consent of the TOIS developers, Part Two was adjusted to the purposes and procedures of this study. The background information items included questions about age, gender, formal computer training, computer experience, online instruction experience, and Internet experience. Additionally, to match pre-test and post-test responses, the participants were asked to indicate their names in the survey.

Data Collection

The researcher approached the instructors teaching nine sections of Microcomputer Applications course with the request to facilitate the data collection. All instructors agreed to allocate 15 minutes of the first class and 15 minutes of the last class of the Microcomputer Applications course to have students complete the TOIS.

At the time set by the instructors of the course, the researcher appeared in class in person and asked the students for voluntary participation in the study. All students present in class during the data collection agreed to participate in the study. Before distributing the survey, the researcher made a short introduction and clarified directions for completing the survey (see Appendix C). The participants were asked to indicate their names in the survey in order to be able to match their pretest responses with posttest responses. The participants were assured of strict confidentiality of the collected data. Hard copies of the Tennessee Online Instruction Scale were distributed to the

participants. It took the students10-15 minutes to complete the survey. Upon completion, the surveys were returned to the researcher.

For convenience, pretest responses were initially grouped by sections. Upon receiving posttest data, the pretest and posttest responses were matched and coded by sequential numbers starting from 1. For example, the first pair of matching responses was coded as *1_1* for the pre-test response, and *1_2* for the posttest response. After coding the matching responses, the participants' names were marked out.

During the pretest data collection, 115 students completed the survey. During the posttest data collection, 95 students completed the survey. Nine students who participated in the pretest data collection demonstrated sufficient computer skills during the Proficiency Test and received the Microcomputer Applications course waiver. Thirteen students dropped the course. Moreover, there were two students who added the course later and did not participate in the pretest data collection. One name was impossible to identify. Therefore, the matching procedure produced 92 matching responses.

The dataset of coded matching responses was entered into a Microsoft Excel worksheet. For each pretest response, 40 survey items were labeled sequentially from 1 to 40 with the extension _1. For each posttest response, survey items were labeled sequentially with the extension _2.

Research Analysis

The data analysis sought answers to the two research questions of this study: (1) the effect of the introductory computer course on online instruction self-efficacy and (2) significance of subjects' demographic variables variables of gender, age, formal

computer training, computer experience, online instruction experience, and Internet experience in relation to online instruction self-efficacy.

The Statistical Package for the Social Sciences (SPSS) 10.1 was used to perform the statistical analysis. During the research analysis stage of the study, a statistical consultant of the University of Tennessee, Knoxville provided advice to the researcher regarding appropriate statistical analyses of the collected data.

The demographic characteristics of the sample were analyzed using frequency distribution. The demographic variables included gender, age, formal computer training, computer experience, online instruction learning experience, and Internet experience. Gender was measured using a nominal scale. The categorical gender factors were assigned two numbers: 1 for females and 2 for males. Age was measured using an ordinal 8-point scale with an interval of five years, ranking the subjects' age from 20 and under to the age over 55. The extent of formal computer training, computer experience, online instruction learning experience, and Internet experience was assessed using a 7-point Likert scale.

To test the hypothesis about the effect of basic computer training on online instruction self-efficacy, a paired t-test was used. Means, standard deviations, t-value, and p-value were calculated for the pretest and posttest responses on online instruction self-efficacy.

The relationships between the dependent variable of posttest online instruction self-efficacy and independent variables of gender and age were analyzed using a univariate analysis of variance (ANOVA). The relationships between the dependent variable of posttest online instruction self-efficacy and the independent variables of

formal computer training, computer experience, Internet experience, and online instruction experience were analyzed using Pearson correlational analysis.

Summary

This chapter presented the research methodology used to meet the purposes of this study. The primary objective of this research was to investigate the effect of basic computer training on online instruction self-efficacy of the participants of the study. The secondary objective was to examine predictive ability of subjects' demographic characteristics on their online instruction self-efficacy beliefs. This chapter described the population and sample of this study, research design and procedures, instrumentation, data collection, and data analysis.

CHAPTER IV

Findings

Introduction

The primary purpose of this study was to investigate the influence of an introductory computer course on online instruction self-efficacy. Additionally, the study investigated students' online instruction self-efficacy beliefs upon completing the computer course and their relation to learners' characteristics. This chapter reports the participants' background, specifically the distribution of the subjects' demographic variables by count and percentage. The results of reliability analysis are also included in this chapter. Finally, this chapter presents findings and discussion of the seven null hypotheses of the study. The chapter ends with the summary outlining the major findings of the study.

Frequency Distribution of Demographic Variables

The demographic background of the population sample was analyzed using frequency distribution. The distribution of the subjects' demographic variables of gender, age, formal computer training, computer experience, Internet experience, and online instruction experience by count and percentage are discussed further in this section.

The majority of the participants were females as seen in Figure 3. Of 92 respondents, 74 (80.4%) were females, and 18 (19.6%) were males.

Figure 4 shows frequency distribution of the subjects' age. The participants were grouped into four age categories: 1) 20 years and under; 2) 21-25 years old; 3) 26-30 years old; and 4) 31-35 years old. The majority of participants were in two age intervals

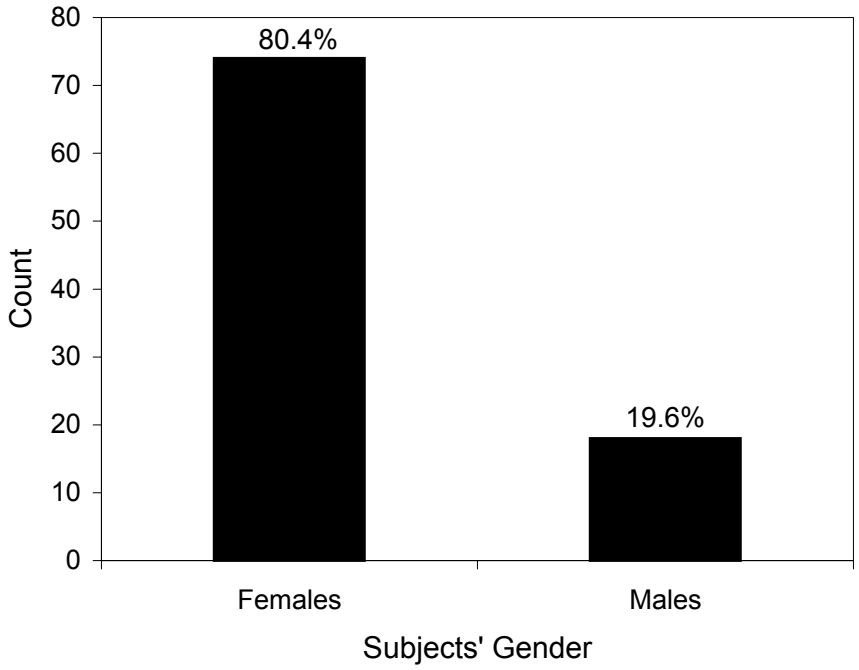

Figure 3. Histogram: number and percentage of female and male respondents

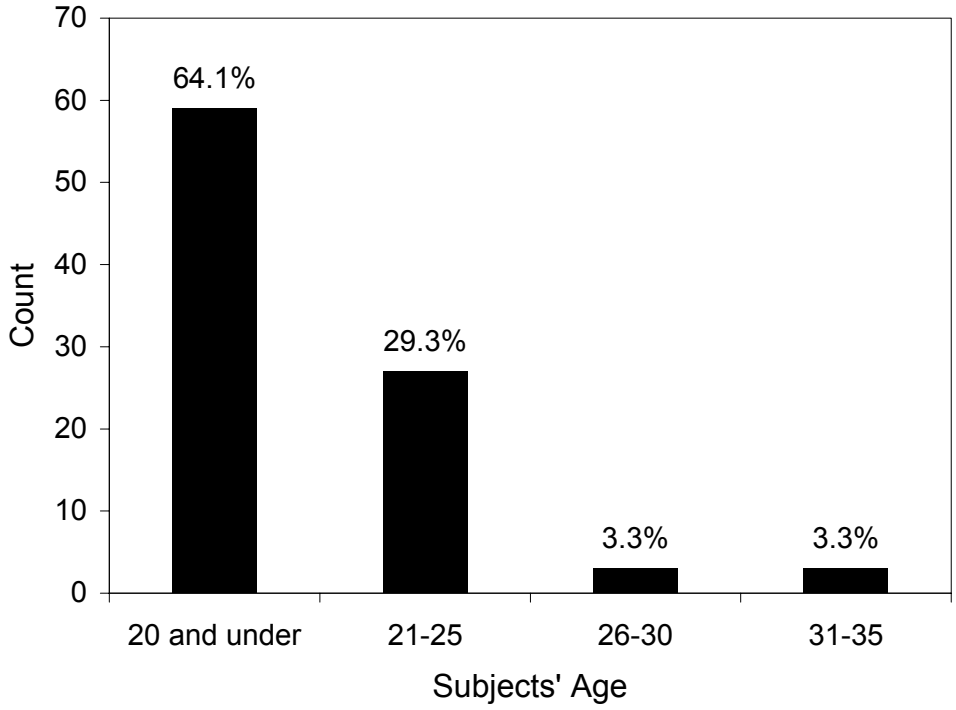

Figure 4. Histogram: number and percentage of respondents by age

with the prevailing group age of 20 and under. Fifty-nine participants (64.1%) were 20 years old and younger. Twenty-seven participants (29.3%) reported being 21-25 years old. Three persons identified themselves as being 26-30 years old and three reported being 31-35 years old. No participants reported being 36 and older.

The extent of self-reported formal computer training ranged from very low to high as seen in Figure 5. The majority of respondents reported average (40 participants) and lower than average (26 participants) extent of formal computer training (43.5% and 28.3% respectively). Ten participants (10.9%) reported very low extent of computer training and eight (8.7%) reported low extent of computer training. Higher than average and high extent of computer training was reported by seven (7.6%) and one (1.1%) participants correspondingly. None of the participants reported to have a very high extent of computer training.

Figure 6 shows the distribution of responses about the demographic variable of computer experience. The participants' responses regarding extent of computer experience were normally distributed on the scale from low to high ranges. The overwhelming number of participants (48, 52.2%) reported having an average extent of computer experience. Almost equal numbers of participants indicated their computer experience as lower than average (18, 19.6%) and higher than average (20, 21.7%). Three participants (3.3%) reported a low level of computer experience, and three (3.3%) reported a high level of computer experience. None reported a very low or very high level of computer experience.

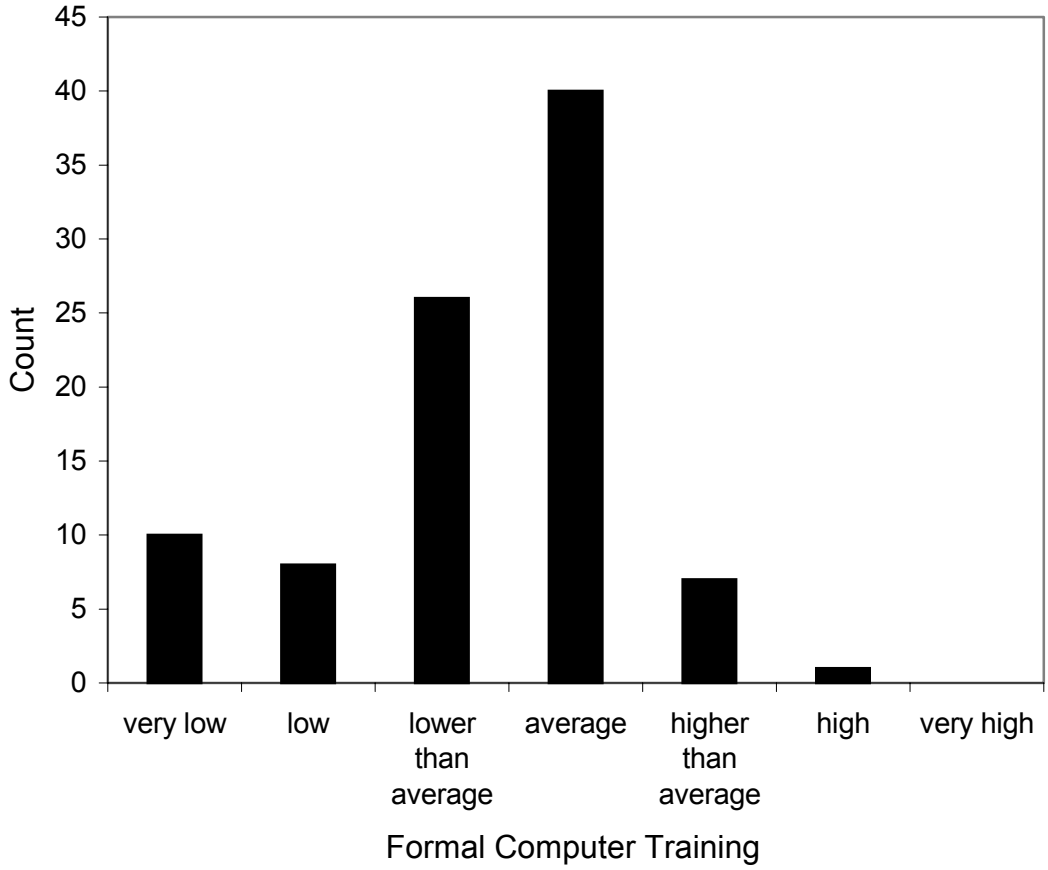

Figure 5. Histogram: distribution of respondents by formal computer training

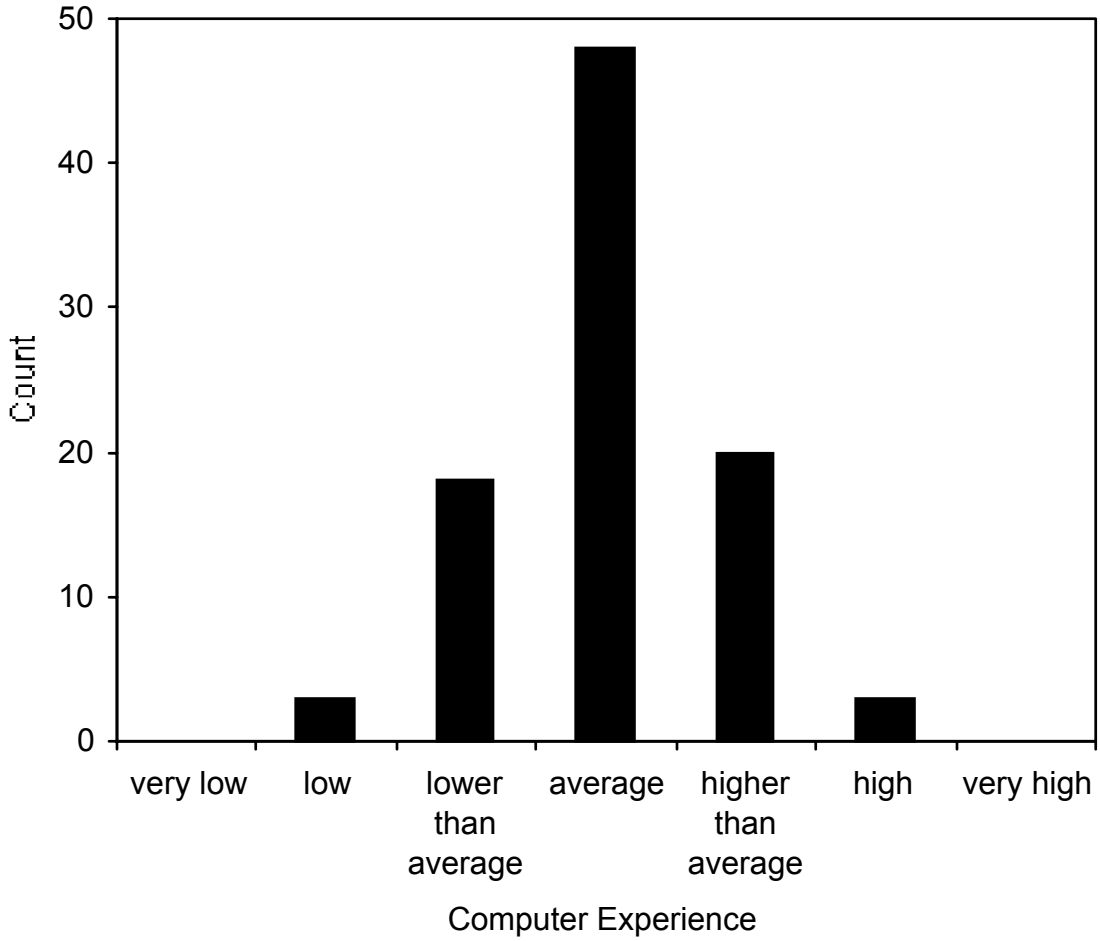

Figure 6. Histogram: distribution of respondents by computer experience

Another demographic variable assessed was the extent of learning experience with online instruction. Figure 7 shows that most responses fell into the range from very low to average. Twelve participants (13.0%) reported having a very low level of online instruction experience. Numbers of people with low, lower than average, and average online instruction experience were relatively similar: 21 (22.8%), 24 (26.1%), and 25 (27.2%) correspondingly. Only nine participants (9.8%) reported higher than average extent of online instruction experience. One person (1.1%) reported a high level of online instruction experience. None reported higher that average level.

The demographic variable of Internet experience was assessed as shown in Figure 8. The responses were skewed towards the higher ranges. Almost half of the participants (41, 44.6%) reported having average extent of Internet experience. Twenty-three (25%) and 12 people (13%) reported having higher than average and average extent of Internet experience correspondingly. Three participants (3.3%) indicated a very high level of Internet experience. Only thirteen responses were within lower ranges. Ten participants (10.9%) reported a lower than average level of Internet experience. Two persons (2.2%) reported a low extent of Internet experience. One participant (1.1%) reported very low Internet experience.

Reliability of the Instrument

To test the reliability of the TOIS items, Cronbach's reliability coefficient alpha was used. The results of pretest and posttest measures on online instruction self-efficacy were analyzed independently. For the pretest scores on online instruction self-efficacy (inventory items from 1 to 40), the Cronbach alpha was .972. For the posttest scores on online instruction self-efficacy (items from 1 to 40), the Cronbach alpha was .974.

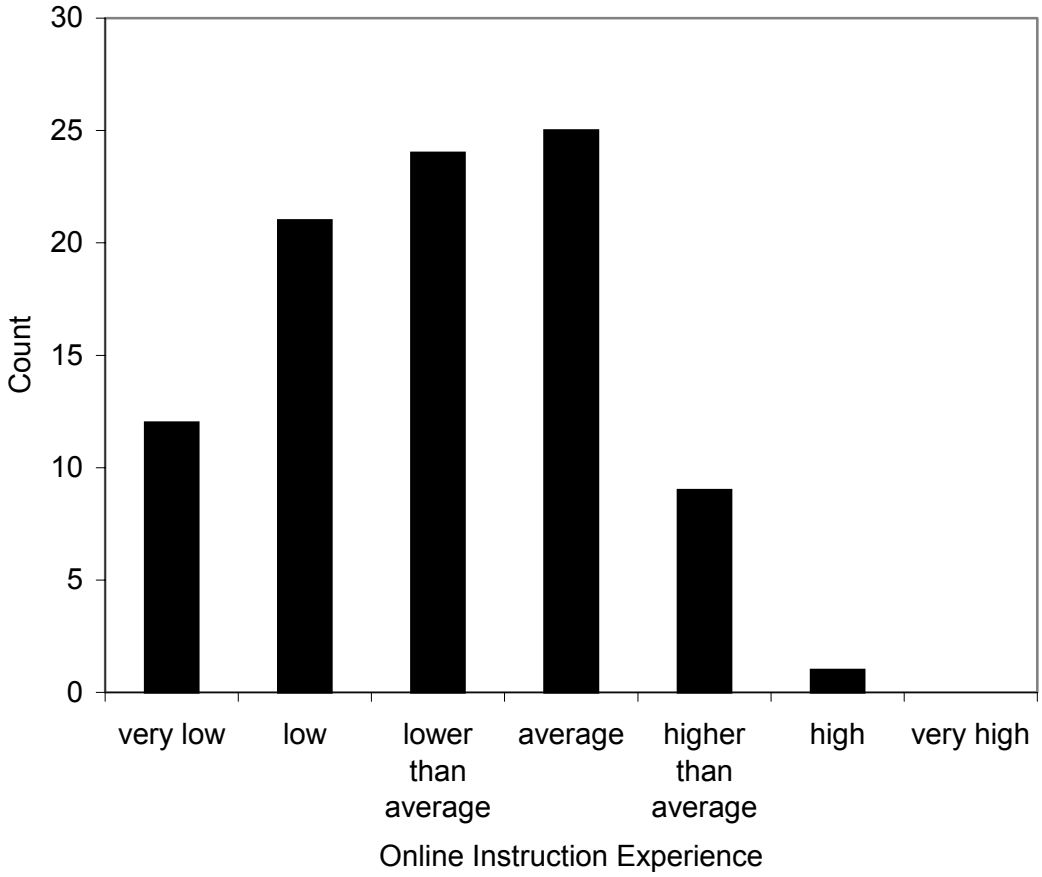

Figure 7. Histogram: distribution of respondents by online instruction experience

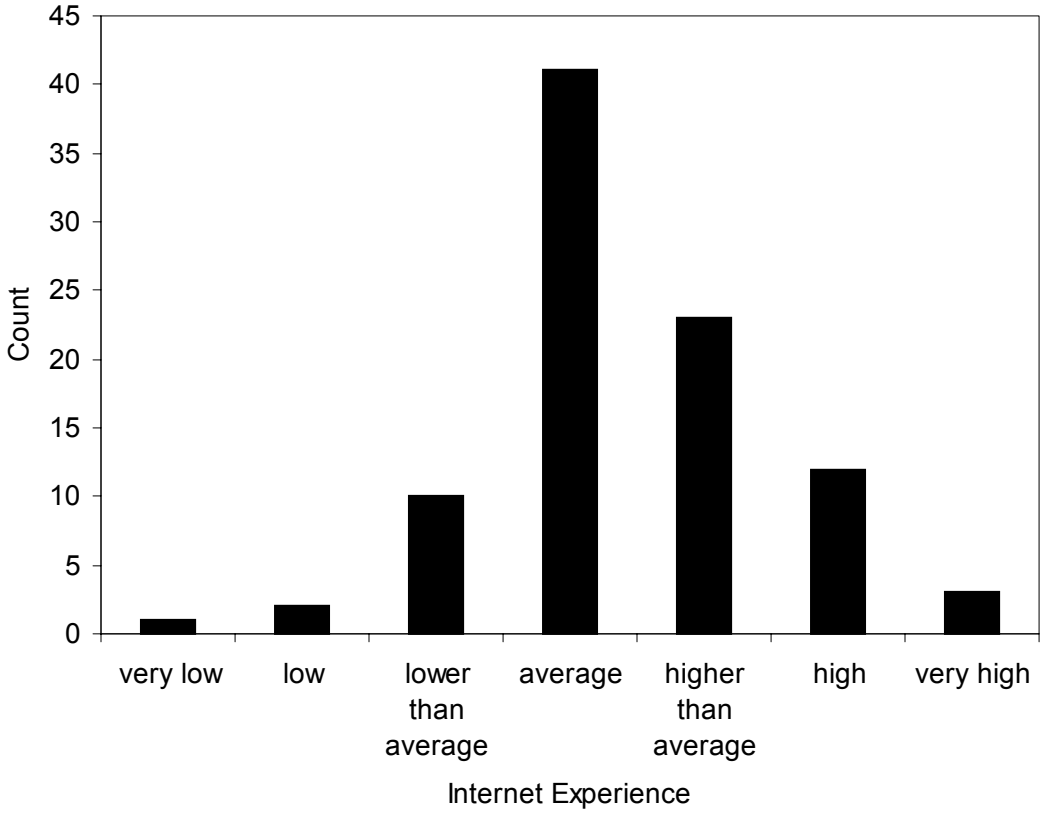

Figure 8. Histogram: distribution of respondents by Internet Experience

Findings for Research Question One ($H_0$1)

Research Question One*: Is there a significant difference in online instruction self-efficacy of undergraduate students as measured by the Tennessee Online Instruction Scale (TOIS) at the beginning and at the end of an introductory computer course?*

To answer this research question, a null hypothesis $H_0$1 was developed and tested. A two-tailed paired t-test was employed to determine if significant difference existed between the pretest and posttest TOIS scores. Means, standard deviations, t-value, and p-value were calculated for the data.

$H_0$1: *There is no significant difference in online instruction self-efficacy beliefs as measured by the TOIS among test subjects at the beginning and at the end of an introductory computer course.*

As Table 1 shows, the total posttest online instruction self-efficacy score (M - 5.41) was significantly higher than the pretest score (M - 5.08, p = .001). The $H_0$1 was rejected. A correlational analysis was also run to see if the total pretest online instruction self-efficacy was related to the total posttest score. Pretest self-efficacy was positively correlated with the posttest self-efficacy at .05 level of significance (r = .55, p = .001).

Findings for Research Question Two ($H_0$2 – $H_0$7)

Research Question Two*: Do online instruction self-efficacy beliefs at the end of an introductory computer course differ significantly for the demographic variables of gender, age, formal computer training, computer experience, personal online instruction learning experience, and Internet experience?*

Table 1

Paired T-Test Analysis for Pretest-Posttest Difference in Online Instruction Self-Efficacy

Students' Total Score	N	M	SD	t	DF	r	p-value
Pretest Online Instruction Self-Efficacy	92	5.08	.96				
				3.46	91	.55	.001
Posttest Online Instruction Self-Efficacy	92	5.41	.97				

To answer this research question, six null hypotheses were developed. Upon the examination of the data, it was determined in consultation with a statistics advisor that null hypotheses 2 and 3 should be analyzed using a univariate analysis of variance and null hypotheses 4, 5, 6, and 7 should be handled using a non-parametric procedure, specifically, Pearson correlational analysis.

H_O2*: There is no significant difference in posttest online instruction self-efficacy beliefs regarding gender as measured by the TOIS among subjects.*

Hypothesis $H_0$2 stated no significant difference between the dependent variable of posttest online instruction self-efficacy and the independent categorical variable of gender. The General Linear Model was used to run a univariate analysis of variance in order to accept or reject this null hypothesis. No significant difference between females and males was established in their online instruction self-efficacy beliefs at the end of the

course. The F-ratio (.002) did not attain significance at the .05 level (p-value = .97) and $H_0$2 was not rejected. See Table 2 for details.

$H_0$3*: There is no significant difference in posttest online instruction self-efficacy beliefs regarding age as measured by the TOIS among subjects.*

Hypothesis $H_0$3 stated no significant difference between the dependent variable of posttest online instruction self-efficacy and the independent categorical variable of age. To test this null hypothesis, the General Linear Model was used to run a univariate analysis of variance. No significant difference among four age groups of respondents was established in online instruction self-efficacy beliefs at the end of the course. The F-ratio (1.42) did not attain significance at .05 level (p-value = .24) and $H_0$3 was not rejected. The results are provided in Table 3.

Hypotheses $H_0$4, $H_0$5, $H_0$6, and $H_0$7 stated no significant relationship between the

Table 2

Univariate ANOVA Test with Gender as an Independent Variable and Posttest Online Instruction Self-Efficacy as a Dependent Variable

Posttest Online Instruction Self-Efficacy	M	SS	DF	MS	F	p
Females	5.41					
		.002	1	.002	.002	.97
Males	5.42					

Table 3

Univariate ANOVA Test with Age as an Independent Variable and Posttest Online Instruction Self-Efficacy as a Dependent Variable

Posttest Online Instruction Self-Efficacy	M	SS	DF	MS	F	p
20 years old and under	5.28					
21-25 years old	5.63					
		4.00	3	1.33	1.42	.24
26-30 years old	5.42					
31-35 years old	6.17					

dependent variable of posttest online instruction self-efficacy and the independent demographic variables of formal computer training, computer experience, online instruction learning experience, and Internet experience. Pearson correlational analysis was conducted to see whether the demographic data could help predict the online instruction self-efficacy at the end of the introductory computer course. The results of correlational analyses and p-values for $H_0$4 - $H_0$7 are shown in Table 4.

Table 4

Correlations of Posttest Online Instruction Self-Efficacy and Demographic Variables of Formal Computer Training, Computer Experience, Online Learning Experience, and Internet Experience.

Independent Demographic Variables	Posttest Online Instruction Self-Efficacy
Formal Computer Training	.258*
Computer Experience	.171
Online Instruction Experience	.273*
Internet Experience	.193

*$p < .05$

H_O4. *There is no significant relationship between posttest online instruction self-efficacy beliefs and the extent of formal computer training as measured by the TOIS among subjects.*

The dependent variable of posttest online instruction self-efficacy and the independent variable of formal computer training measured at the beginning of the introductory computer course were found to be positively correlated (r = .258) at .05 significance level (p-value = .013). $H_0$4 was rejected.

H_O5. *There is no significant relationship between posttest online instruction self-efficacy beliefs and the extent of computer experience as measured by the TOIS among subjects.*

The dependent variable of posttest online instruction self-efficacy and the independent variable of computer experience measured at the beginning of the

introductory computer course were not found to be correlated (r = .171) at .05 significance level (p-value = .102). $H_0$5 was not rejected.

$H_0$6. *There is no significant relationship between posttest online instruction self-efficacy beliefs and the extent of online instruction experience as measured by the TOIS among subjects.*

The dependent variable of posttest online instruction self-efficacy and the independent variable of online learning experience measured at the beginning of the introductory computer course were found to be positively correlated (r = .273) at .05 significance level (p = .008). $H_0$6 was rejected.

$H_0$7. *There is no significant relationship between posttest online instruction self-efficacy beliefs and the extent of Internet experience as measured by the TOIS among subjects.*

The dependent variable of posttest online instruction self-efficacy and the independent variable of Internet experience measured at the beginning of the introductory computer course were not found to be correlated (r = .193) at .05 significance level (p-value = .065). $H_0$7 was not rejected.

Summary

This chapter described the subjects' demographic background, specifically the distribution of the demographic variables by count and percentage. Most subjects appeared to be females and within the age group of 18 and under and 25 years old. Certain degrees of skewedness were revealed for the responses on formal computer training, online instruction experience, and Internet experience. The findings confirmed the reliability of the TOIS used in this research to measure the participants' online instruction self-efficacy beliefs.

This chapter reported the results of testing the null hypotheses. It was found that for the population of this study, online instruction self-efficacy assessed by the TOIS significantly increased at the end of the introductory computer course. Formal computer training and online instruction experience were found to be significantly related to posttest online instruction self-efficacy beliefs of the subjects.

CHAPTER V

Conclusions, Implications, Recommendations, and Summary

The purpose of this study was to investigate the influence of an introductory computer course on online instruction self-efficacy and the relation of learners' online instruction self-efficacy beliefs upon course completion to their personal characteristics including age, gender, formal computer training, computer experience, online instruction experience, and Internet experience. This was accomplished by assessing the online instruction self-efficacy of undergraduate students of the College of Human Ecology, the University of Tennessee at the beginning and at the end of a basic computer course. This chapter presents conclusions, implications, recommendations, and summary of the study.

Conclusions

Participants' demographic characteristics

This study involved the population of the undergraduate students of the College of Human Ecology who were enrolled in the Microcomputer Applications course in fall and summer of 2002. The students were surveyed for demographic variables of gender, age, computer training, computer experience, online instruction experience, and Internet experience.

The analysis of the demographic variables showed the lack of equal distribution of the sample regarding gender and age. The respondents were primarily females (80.4%). The majority of respondents were grouped into two age categories: 20 years and younger (64.1%) and 21-25 years old (29.3%). These age groups may have different computer-related experiences compared to older age groups.

The participants reported various levels of computer experience. The responses on computer experience were normally distributed on the histogram. For formal computer training, online instruction experience, and Internet experience, certain degrees of skewedness of the data were revealed.

The responses about formal computer training were distributed within low, average, and higher than average ranges. Only one respondent reported a high level of formal computer training (1.1%). The lack of high extent of formal computer training may be explained by the fact that all enrolled students were given an opportunity to waiver the required introductory computer course by taking a pretest. Those students who demonstrated basic computer competencies did not participate in the course. Thus, most of the respondents did not have extensive computer training.

The responses about online instruction experiences were distributed within low, average, and higher than average ranges. Only one respondent reported a high level of online instruction experience (1.1%). Possible explanation for this may be the fact that some online courses require completing the introductory computer course as a prerequisite. Therefore, many students entered the Microcomputer Applications class without much online learning experience.

Most of the students (85.8%) reported the average and higher levels of Internet experience. This finding was not surprising because of increased accessibility of the Internet. However, a relatively low level of formal computer training and relatively high level of Internet experience of the subjects may indicate that students often use the Internet without acquiring other basic computer skills.

Research question one

Is there a significant difference in online instruction self-efficacy of undergraduate students as measured by the Tennessee Online Instruction Scale (TOIS) at the beginning and at the end of an introductory computer course?

The present study examined the assumption that an introductory computer course might affect students' perceptions of their abilities to perform in online instruction. The review of related research revealed evidences that computer training was a factor in improving computer self-efficacy (Karsten & Roth, 1998; Smith,, 1994; Torkzadeh & Koufteros, 1994). The social-cognitive theory posits that once attained in one task situation, self-efficacy may generalize to other similar situations under certain conditions (Bandura, 1997) such as similarity of skills for different tasks, co-development of different activities, commonalties among activities, and transforming experiences. Therefore, it was expected that the effect of computer training could extend to another computer-related learning environment, specifically, online instruction self-efficacy.

The results of the study showed that for the population of this study, online instruction self-efficacy assessed by the TOIS improved at the end of an introductory computer course. This finding is consistent with the implications of the literature and studies on computer-related self-efficacy.

The total pretest online instruction self-efficacy was found to be positevely and moderately correlated with the total posttest score ($r = .55$). Those participants who reported relatively lower levels of online instruction self-efficacy tended to report lower scores at the end of the computer course, and vice versa. This finding may suggest that irrespectively of the level of self-efficacy that students reported initially, the gain in

online instruction self-efficacy at the end of the course was approximately the same for different levels of perceived self-efficacy.

Research question two

Do online instruction self-efficacy beliefs at the end of an introductory computer course differ significantly for the demographic variables of gender, age, formal computer training, computer experience, online instruction learning experience, and Internet experience?

The review of related literature revealed mixed findings about the role of demographic variables in computer-related self-efficacy. Therefore, it was decided to examine participants' individual differences and their relation to online instruction self-efficacy.

Gender

For this study's population, gender was not found to be a factor in posttest online instruction self-efficacy beliefs. This finding is inconsistent with the results of studies on computer self-efficacy where gender was a significant predictor of self-efficacy beliefs (Chou, 2001; Rozell, 1992; Schumacher & Morahan-Martin, 2001; Whitley, 1997) and supports those studies that did not find significant gender differences (Henry & Stone, 1999; Karsten & Roth, 1998; Ren, 2000). However, due to the high number of females in the sample (80.4%), it is not possible to make adequate conclusions about the role of gender in online instruction self-efficacy in this study.

Age

No significant difference in posttest online instruction self-efficacy was found for the age. Unfortunately, the lack of equal distribution of the sample for age does not allow

drawing any further conclusions about the relationship between age and online instruction self-efficacy. More studies with rigorous research design and bigger and more diverse population are needed to establish the role of age in self-efficacy perceptions regarding online instruction.

Formal computer training

This study found a significant positive correlation between posttest online instruction self-efficacy and the level of formal computer training for this sample. The finding is consistent with the conclusions of studies about a significant role of formal computer training in computer-related self-efficacy (Karsten & Roth, 1998; Salanova et al., 2000; Smith, 1994, Smith-Weber, 1999; Torkzadeh & Koufteros, 1994).

However, this finding should be treated with caution. Although a significant relationship was found, it was not particularly strong ($r = .258$). Moreover, levels of reported formal computer training were generally low for this sample due to the specificity of the sample. The students who demonstrated satisfactory computer competencies and might have reported high levels of formal computer training scored out of the course and did not participate in the study. Therefore, for this population, the demographic variable of formal computer training is not very indicative.

Computer experience

This study did not find a significant relationship between computer experience and online instruction self-efficacy. This finding seems to contradict those reviewed studies where computer experience was found to be positively correlated with computer self-efficacy (Coffin & MacIntyre, 1999; Ertmer et al, 1994; Robertson & Stanforth,1999; Schumacher & Morahan-Martin, 2001) and online instruction self-

efficacy (Randall, 2001). These studies are supported by the self-efficacy theory that identified mastery experience as the most influential source of self-efficacy. Logically, computer experience is expected to predict computer self-efficacy. However, online learning requires not only computer skills but also skills specific for online instruction, namely, collaborative and individual learning skills (Randall, 2001). Thus, for this sample, computer experience did not appear to be a strong source of online instruction self-efficacy.

Online instruction experience

Conversely, online instruction experience seems to provide the direct source of self-efficacy information for this particular domain of instruction. Therefore, it was not surprising to find a significant correlation between online instruction experience and online instruction self-efficacy. The finding is consistent with the results of Randall's study (2001) that used the population of electrician instructors. Though, the relationship was not particularly strong ($r = .273$). One should note that for this sample, the responses mainly ranged within low and higher than average levels of online instruction experience. Therefore, this finding might need further confirmation in other studies.

Internet experience

Though literature review revealed research that found Internet experience to be related to online instruction self-efficacy (Randall, 2001), computer self-efficacy (Lim, 2000), and self-efficacy for electronic information search (Ren, 2000), no significant relationship between online instruction self-efficacy and Internet experience was found in this study.

Self-efficacy theory may provide explanation for this finding. According to Bandura (1997), self-efficacy may generalize to other situations when similarity of skills for different tasks is required. Internet experience might be a primary source for self-efficacy for Internet use. However, a different range of skills required for Internet use and online learning may have prevented relating Internet self-efficacy to online instruction self-efficacy.

Implications

The findings of the study have implications for administrators, educators, and instructional designers who are involved in building undergraduate programs with online presence. Additionally, this research has added to understanding the construct of self-efficacy in online instruction.

1. This study contributed to clarifying the role of basic computer training in an undergraduate program utilizing online technologies. The study provided evidence that upon completing an introductory computer course, undergraduate students became more confident in their abilities to participate in online instruction. Therefore, the value of basic computer training for online instruction should be considered when building an undergraduate program with online presence.
2. This study has implications for the scope and sequence of courses in the online curriculum development. Given the important role of basic computer training in online instruction, an introductory computer course should precede online courses and serve as a prerequisite for them. Additionally, online

courses should utilize to the full extent the skills and self-efficacy perceptions acquired by students during a computer course.

3. This study has implications for design and development of a basic computer course in the undergraduate curriculum with online presence. Such computer course should be developed with the consideration of competencies and perceptions that ensure successful performance in online instruction. For example, this study found that the extent of online instruction experience was a significant predictor of online instruction self-efficacy. Therefore, including elements of online learning in an introductory computer course could be favorable for improving students' self-beliefs about their abilities to participate in online instruction.
4. This study has implications for online course designers by emphasizing the role of basic computer training in online instruction. In case when an introductory computer course is not included in the program of study, an online course should start with a basic computer competencies tutorial.
5. The responses did not reveal significant differences in online instruction self-efficacy beliefs among students with different levels of computer and Internet experience. These results may suggest that these individual experiences may not serve to the online instructors as reliable indicators of students' confidence in their abilities to learn online.
6. This study contributed to research on self-efficacy beliefs in a comparatively new domain, online instruction. Knowledge of factors in increasing online instruction self-efficacy beliefs will lead to creating more effective online

instruction programs. Information related to the effects of demographic characteristics on self-efficacy will assist educators and instructional designers to tailor the course design and development to the needs of learners.

Recommendations

Identifying the perspectives of future research studies, a number of recommendations are suggested.

1. This study revealed significant improvement of online instruction self-efficacy beliefs for this population at the end of basic computer instruction. However, further research using a more rigorous research design including randomized sampling and pretest-posttest procedures with a control group is recommended to validate the results of this study.
2. The small size of the population considerably limited the generalization of the results of this study. The population included undergraduate students of the College of Human Ecology that were enrolled in the Microcomputer Applications course. Further research that would use bigger and more diverse populations in higher education and corporate training is needed to confirm the conclusions of the study.
3. The lack of equal distribution of the population sample considerably limited the analysis of demographic variables. Though some demographic variables (formal computer training and online instruction experience) were found to be predictive of online instruction self-efficacy, these findings cannot be conclusive because there was some skewedness of responses towards lower levels of formal computer training and online instruction experience.

Conversely, it is hard to fully accept the conclusions about non-significant differences for age and gender since the sample included mainly females (80.4%) and students younger than 25. Therefore, it is recommended that future research studies use populations with a wider range in age, more balanced in gender, and different levels of computer training and computer-related experiences.

4. This study investigated the effect of basic computer training on online instruction self-efficacy without considering such factors as instructional methods and techniques, instructor's teaching style, and length of instruction. It is recommended that future research control these variables when establishing a research design of the study.
5. This study investigated the relationship between computer-related individual characteristics and online instruction self-efficacy. However, research suggested that besides computer/Internet component, online learning includes collaborative and individual factors (Randall, 2001). Therefore, it is recommended that personal characteristics related to collaborative and individual behaviors be examined in further studies.
6. It is recommended that other sources of online-instruction self-efficacy be researched. The importance of basic computer training in online instruction self-efficacy is supported by the self-efficacy theory on performance accomplishments as the primary source of self-efficacy. Other major sources of online instruction self-efficacy including vicarious learning experiences,

verbal persuasion, and physiological state that were identified by the self-efficacy theory (Bandura, 1997) should be investigated.

Summary

This study originated from the review of self-efficacy literature and research. The analyzed research indicated that basic computer training was a significant source of computer self-efficacy. The review of self-efficacy literature revealed possibility that basic computer training might be a significant source of online instruction self-efficacy as well. Additionally, the research suggested the existence of relationship between computer-related self-efficacy and certain personal characteristics. This study attempted to test these assumptions.

This study investigated the effect of an introductory computer course on online instruction self-efficacy beliefs of 92 undergraduate students of the College of Human Ecology, the University of Tennessee who were enrolled in the Microcomputer Applications course in fall and summer 2002. Online instruction self-efficacy beliefs were assessed by administering the TOIS at the beginning and the end of the course. The students' demographic variables of gender, age, formal computer training, computer experience, online instruction experience, and Internet experience and their relation to posttest online instruction self-efficacy were also examined.

Seven null hypotheses were developed for this study. The first null hypothesis focused on the effect of an introductory computer course in online instruction self-efficacy. The other null hypotheses stated no relationship between students' demographic variables and online instruction self-efficacy.

It was found that for the population of this study, online instruction self-efficacy assessed by the TOIS improved at the end of an introductory computer course. The reliability of the TOIS was found to be satisfactory (Cronbach alpha = .97). The demographic variables of formal computer training and online instruction experiences appeared to be significantly related to posttest online instruction self-efficacy beliefs of the subjects. However, since this study did not avoid limitations in the research design, the findings should be treated with caution and be confirmed by further research.

Based on the findings and conclusions, it was recommended that future research use a more rigorous research design including randomized sampling, pretest-posttest procedures with a control group, and bigger and more diverse populations. When investigating the effect of basic computer training, it was recommended to control for instructional methods and techniques, instructor's teaching style, and length of instruction. Personal characteristics related to collaborative and individual behaviors in online instruction might need more attention from the researchers. Finally, other sources of online instruction self-efficacy besides a basic computer course were recommended for future research.

This study has implications for administrators, educators, and instructional designers who are involved in building undergraduate programs with online presence. Additionally, this research contributes to understanding the construct of self-efficacy in online instruction.

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Appendices

Appendix A

Letter of Permission and Form A

THE UNIVERSITY OF TENNESSEE

Department of **Human Resource Development**
310 Jessie Harris Building
Knoxville, TN 37996-1900
Telephone: (865) 974-2574
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MEMORANDUM

TO: Iryna P. Loboda, HRD Graduate Student

FROM: Dr. Michael Lane Morris, Interim Department Head, Human Resource Development, and Chair of the Subjects Review Committee

DATE: April 23, 2002

RE: Form A - Certification for Exemption from IRB Review for Research Involving Human Subjects

Your request pursuant to your recent Form A (Certification for Exemption from IRB Review for Research Involving Human Subjects) has been approved by UTK's Office of Research for a period of up to one year. Please note that if the research project has not been completed within the one-year period you must submit a new Human Subjects Form in order to continue the project.

As the HRD Department's Human Subjects Review Chair, please feel free to contact me if you have any questions.

C: Ms. Brenda Lawson, UTK's Office of Research
Dr. Gregory C. Petty, Professor
HRD Office File

FORM A

IRB # _____

Certification for Exemption from IRB Review for Research Involving Human Subjects

---

A. **Principal Investigator(s) and / or CO-PI(s):**
Student: Iryna P. Loboda
Advisor: Gregory C. Petty

B. **Department:** Human Resource Development, College of Human Ecology

C. **Complete Mailing Address and Phone Number of PI(s) and Co-PI(s):**

Iryna P. Loboda	Gregory C. Petty
425 E Scott Ave	Department of Human Resource Development
Knoxville, TN 37917	310 Jessie Harris Building
865-523-2635	Knoxville, TN 37996
	865-974-2574

D. **Title of Project:** The Impact of an Introductory Computer Course on Online Instruction Self-efficacy of Undergraduate Students

E. **External Funding Agency and ID Number**: n/a

F. **Grant Submission Deadline**: n/a

G. **Starting Date:** April 16, 2002

H. **Estimated Completion Date:** November 15, 2002

I. **Research Project**:
Objectives: (1) to investigate the influence of an introductory computer course on online instruction self-efficacy; (2) to investigate students' online instruction beliefs and their relationship to learners' characteristics including age, gender, formal computer training, computer experience, online instruction learning experience, and Internet experience.
Subjects: Participants will be undergraduate students of the College of Human Ecology enrolled in HRD 210, a microcomputer applications course in spring 2002 and summer 2002. Participation will be voluntarily.
Methods and Procedures: A self-report survey, the Tennessee Online Instruction Scale developed by F. Randall and G. Petty will be administered to the participants by Dr. G. Petty and I. Loboda. The survey will include 40 items measuring perceptions of online instruction self-efficacy and demographic questions. The responses will be coded and entered in an Excel data sheet. During the analysis, the investigators will deal only with codes. Thus, the confidentiality of data will be obtained and maintained.

J. **Certification**: The research described herein is in compliance with 45 CFR 46.101(b) and presents subjects with no more than minimal risk as defined by applicable regulations.

	Signature	Name	Date
Principal Investigator		Iryna Loboda	04/15/02
Student Advisor		GREGORY PETTY	4/15/2002
Dept. Review Comm. Chair		Vickie J. Stout	4-17-02
APPROVED: Department Head		Michael Lane Morris	4/19/02

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. 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] Your first and last name: _____

(2) Gender:
female _____
male _____

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

(4) Please circle the number that reflects the extent of your formal computer training:

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

(5) 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

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

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 Internet experience:

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

Appendix C

Introduction Made in Class Before Administering the TOIS

Introduction Made During the Pretest Survey of Students

Hello. My name is Iryna Loboda. I am a Graduate Teaching Assistant of the HRD Department. I am here today to ask you to participate in a research study. You are requested to complete a survey at the beginning and at the end of the Microcomputer Applications course. The purpose of this survey is to obtain information about your beliefs regarding your ability to participate in an online course.

Your participation is voluntary and will not affect your grade in this course. Your responses will be kept strictly confidential. In order to match the responses at the beginning and at the end of the course, I request that you indicate your name. After the matching both your responses, they will be coded, and your names will be marked out.

Please, read the definition of an online course and instructions provided in the survey. If you need clarification of instructions or definition of terms, do not hesitate to ask me. Thank you for your participation!

Introduction Made During the Posttest Survey of Students

Hello. Do you remember me? My name is Iryna Loboda. I am a Graduate Teaching Assistant of the HRD Department. I visited your class at the beginning of the semester asking you to complete a survey. The purpose of this survey is to obtain information about your beliefs regarding your ability to participate in an online course. This is the second phase of the study when you need to complete the survey at the end of the course.

Your participation is voluntary and will not affect your grade in this course. Your responses will be kept strictly confidential. In order to match your responses with those you completed at the beginning of the course, I request that you indicate your name. After matching both your responses, they will be coded, and your names will be marked out.

Please, read the definition of an online course and instructions provided in the survey. If you need clarification of instructions or definition of terms, do not hesitate to ask me. Thank you for your participation!

Vita

Iryna Loboda was born in Russia on April 28, 1965. She graduated with distinction from a public high school in Ukraine. In 1988, Iryna graduated with honors from Moscow's University of Peoples' Friendship where she got a Master of Arts degree with Major in Russian as a Foreign Language. After graduation, she lived for two years in Cuba where she taught Russian. From 1991 to 1999, she worked as an English language instructor at the Department of Foreign Languages, Donetsk National University, Ukraine. In 1999, Iryna won a professional development grant and came to the University of Tennessee as a visiting scholar. In 2000, she entered the Graduate Program in Human Resource Development, The University of Tennessee. During her graduate study, Iryna worked as a Graduate Teaching Associate and provided translation services to the Community Action Committee, Knoxville, TN.