Computer-Mediated Communication Technologies and Self-Efficacy in Online Learning

Kim Tran, PhD
WALDEN UNIVERSITY

Walter R. McCollum, PhD
NEW YORK UNIVERSITY

Computer-mediated communication (CMC) technologies have significantly influenced the electronic learning that has increased over the past several years. Yet there is a lack of understanding regarding how students use CMC technologies to increase self-efficacy in an online learning environment. The purpose of this quantitative correlation study was to understand the relationship between students' beliefs in the quality of online instruction and their engagement with online learning mechanisms through CMC technologies. The research questions were designed to investigate the relationship between usefulness and ease of use of CMC technologies and students' self-efficacy in an online learning environment and how students' perceptions of quality online instruction influenced their self-efficacy in an online learning environment. Bandura's self-efficacy and technology acceptance model were used as the theoretical framework. The data were from undergraduate and graduate students and gathered via an anonymous online survey. The data were analyzed using multiple regressions and Pearson's correlation coefficient. The results of the study showed a significant positive correlation between the ease of use and usefulness of CMC technologies, quality online instruction, and self-efficacy. The implications for the study included enabling university leaders to provide the most effective CMC technology options to support students in achieving their educational goals.

Key words:*e-learning, computer-mediated communication, self-efficacy, technology acceptance theory, ease of use of CMC, usefulness of CMC, quality of online instruction*

Introduction and Background

E-learning involves computer-mediated communication technology. Most adult learners consider themselves working adults first and students second and choose to continue their education using e-learning systems as they can access their courses anywhere and anytime (Bush, 2005). The interest in e-learning has led to a rapid increase in the number of students taking online courses. E-learning has substantially grown, and more than 5.6 million students were taking at least one online class in the 2009 fall semester, which represented an increase of approximately 1 million students more than the number reported in 2008 (Allen & Seaman, 2010, p. 7). The significant increase from 1.6 million students taking at least one online class in fall 2002 to 5.6 million in fall 2009 translates into a compound annual growth rate of 19%. The trend is true in the United States, where e-learning systems have proliferated.

The need fore-learning continued to grow for two reasons. The first reason is improved technologies and Internet expansion around the world (Edwards, 2009, p. 5). The second reason is students' beliefs in the quality of online instruction are associated with their engagement in the online learning mechanisms through CMC technologies (LeBaron & Santos, 2010, p. 10). Students also perceive the usefulness and ease of use of CMC technologies (Davis, 1989) such as e-mail (Newman, 2007), discussion boards (Cyprus, 2010), and teleconferencing (Garrison, 1997) to assist in their success in online learning. Stafford and Lindsey (2007) noted that more nontraditional students would enroll in e-learning while the number of traditional learners would decline in the future. University leaders should understand the

degree to which students believe the quality of online instruction is associated with students' engagement in online learning mechanisms through CMC technologies (LeBaron & Santos, 2010, p. 10).

In particular, based on the literature reviewed, researchers have not studied the degree to which students believe the quality of online instruction is associated with their engagement in the online learning mechanisms through CMC technologies (Yang & Cornelious, 2005, p. 7). This study emphasized researchers have used social cognitive theory (Bandura, 1986) and self-efficacy (Bandura, 1997) to address human learning behavior. Students' perception of CMC technologies as being useful and easy to use (Davis, 1989) may be associated with the effectiveness of quality online instruction.

Statement of the Problem

The research problem addressed in this study was that university leaders were implementing CMC technologies even though it was unclear how CMC technologies affected students' self-efficacy in an online learning environment. Scholars have debated the relationship between students' comfort levels using the Internet and their satisfaction with online courses, which may relate to students' perceived learning effectiveness (Rodriguez, Ooms, & Montanez, 2008, p. 106). Yet researchers have not clearly measured the relationship between students engaging with CMC technologies, the degree to which students believe in the effectiveness of online instruction, and students' self-efficacy in an online learning environment.

This study involved exploring the relationship between students' reports of adopting of CMC technologies and the degree to which students believe in the quality of online instruction, their perception of ease of use and usefulness of CMC technologies, and their perception of online learning effectiveness. The results of this study may enable university leaders to understand which CMC technologies students use most and how each technology option can affect the students' perceptions of online learning and their beliefs of instruction in an online environment.

Purpose of the Study

The purpose of this study was to develop an understanding regarding how much students' beliefs in the effectiveness of online instruction were associated with their engagement in online learning mechanisms using CMC tools (LeBaron & Santos, 2010, p. 10). The purpose of this study was to examine the relationship between students' reports of adopting CMC technologies in online environments and students' perceptions of online learning effectiveness. This study also may help university leaders to have a better understanding and be able to predict online learning success for students who adopt CMC technologies.

Definition of Terms

The focus of this research was on the following four main variables: ease of use of CMC, usefulness of CMC, and quality of online instruction (independent) and self-efficacy in online learning (dependent). A brief overview of those constructs and related concepts follows:

Ease of Use of CMC

Davis (1989) noted that the perceived ease of use has a significant effect on and relationship with attitude through its self-efficacy and instrumentality. Easier-to-use technology relates to students' high efficacy and personal commitment regarding their ability to use the technology (Davis, 1989).Bush (2005) noted that the strong relationship between perceived ease of use and perceived usefulness

specified that technologies that are easy to use can improve performance (p. 48). CMC technologies that are easy to adopt are likely to assist students in accomplishing higher quality coursework (Bush, 2005, p. 48).

Usefulness of CMC

Straub (2009) reported that perceived usefulness refers to the degree to which an individual believes using a particular technology can enhance his or her job performance (p. 638).Straub (p. 638) also agreed with Davis's (1989) work that an individual's perception toward technology is important in regard to the link between perceived usefulness and how innovative an individual might be.

Quality of Online Instruction

Quality online instruction can mean more work for the instructor, yet a good course design can result in collaboration between the instructor and the students that is more effective (Lauron, 2008, p. 118). According to Lauron (2008, p. 113), collaboration using CMC technology can be an effective strategy in creating quality online instruction. Lauren (2008, p. 109) focused on the importance of collaboration in quality instruction using CMC tools. Lauron (2008, p. 113) noted multiple CMC tools can be used to facilitate and stimulate collaboration in online learning. By using proper CMC technologies, students can create a positive perception of the effectiveness of online instruction.

Self-Efficacy in Online Learning

Empirical research has supported the importance of self-efficacy for students' success in online education using CMC technology (McCollum & Abdul-Hamid, 2010). The influence of social cognitive theory can be seen through the students' belief that they can overcome technological challenges, which is an influence on their ability to control their future thoughts and actions (Bandura, 1986).According to Bandura (1997), self-efficacy is the focus on adjustment based on an individual's ability to achieve (p. 3). Bandura (1997) further contended that self-efficacy perception is how people can think, feel, and motivate themselves with regard to their commitment to the goals they choose to pursue (p. 71).

Assumptions and Limitations

The assumption for this study was that participants' responses were honest. Participants had experience in online learning. Participation in the study was voluntary, participants were not required to complete the entire survey, and participants could withdraw from the survey at any time. After reading the consent form, potential participants were able to ask any questions they may have before agreeing to participate in the study. The consent form included an assurance of confidentiality of the results, as all data collected would remain on a secured server, and the transmission of data would involve an encrypted communication channel. All information participants provided would remain confidential. The last assumption was CMC technologies would continue to be used in higher education, and students would continue to gain learning experience while using them.

A possible weakness of this study was that the survey was limited to an online university, which was a limited section of the undergraduate and graduate population of the university. This study might therefore lack generalizability. Because the survey was performed anonymously, the participants were not asked the questions in person.

Literature Review

The technology acceptance model (Davis, 1986) served as the framework for this study. The technology acceptance model conceptual framework was used in the technology adoption theory to examine

students' reports of adopting CMC technologies through a synthesis of the lenses of Rogers's (2003) innovation diffusion theory, the concerns-based adoption model, and the unified theory of acceptance and use of technology (Straub, 2009). The technology adoption theory was used to explain that students' adoption illustrates a successful implementation of CMC tools in an online environment. Students who choose to engage a technology (Straub, 2009, p. 625) and perceive the ease and usefulness (Davis, 1986; Straub, 2009, p. 626) of CMC tools in online learning tend to be successful in an online learning environment.

Ease of Use of CMC

Perceived Ease of Use

Davis (1989) noted that the perceived ease of use has a significant effect on and relationship with attitude through its self-efficacy and instrumentality. Easier-to-use technology relates to students' high efficacy and personal commitment regarding their ability to use the technology (Davis, 1989). Ku (2009) noted that a student's perception regarding the ease of use of technology has a direct effect on perceived usefulness. Both perceived ease of use and perceived usefulness of technology have an effect on attitude toward using computers (Ku, 2009, p. 12). Bush (2005) noted that the strong relationship between perceived ease of use and perceived usefulness specified that technologies that are easy to use can improve performance (p. 48). CMC technologies that are easy to adopt are likely to assist students in accomplishing higher quality coursework (Bush, 2005, p. 48).

Perceived Ease of Use Related to CMC Technologies

Naor-Elaiza and Geri (2009, p. 347) contended perceived ease of use of technology, students enhance behavior intention, students believe using CMC such as an e-mail or a website would be easy of use. Using CMC technologies, students can write to their instructors or other students anywhere and anytime. Students also easily access the website of their academic course to view the learning materials and interact with instructors and classmates. In addition, students can post their questions and sometimes receive a quick reply (Naor-Elaiza & Geri, 2009, p. 347).

Usefulness of CMC

Perceived Usefulness

Straub (2009) reported that perceived usefulness refers to the degree to which an individual believes using a particular technology can enhance his or her job performance (p. 638). Perceived usefulness consistently influences the future adoption of technology (Straub, 2009, p. 638). Straub (p. 638) also agreed with Davis's (1989) work that an individual's perception toward technology is important in regard to the link between perceived usefulness and how innovative an individual might be.

Perceived Usefulness Related to CMC Technologies

According to Naor-Elaiza and Geri (2009, p. 346), students might choose an online assignment submission system to submit their assignments to their tutors. A simple system can be helpful, as students can check their assignment grades online (Buzzetto-Moore, 2008). Such a system is expected to be valuable to an online learning or blended learning environment because it provides students fast feedback on their assignment (Naor-Elaiza & Geri, 2009, p. 346). The basis of Naor-Elaiza and Geri's research was primarily the technology acceptance model and diffusion of innovation model, and the research was empirically investigated usinga Web survey with 89 tutors (p. 345). Behavior intention to use the system was affected by compatibility with students' assignment-checking process, its perceived

usefulness and its value, and a tutor's attitude toward adopting CMC technologies (Naor-Elaiza & Geri, 2009, p. 345).

Quality of Online Instruction

Kidd (2005) noted that design of instruction and accessibility are important factors in the instructional quality of online learning (p. 60). The effectiveness of the design of the course website helps students learn to develop learning skills such as collaboration, teamwork, and time management to help them be successful in their online courses. The use of CMC tools for online courses allows students to innovate and gain experience with technology (Kidd, 2005, p. 60). The results were that positive and motivated students continue their learning in a positive manner in an online learning environment (Kidd, 2005, p. 60). Kidd not only demonstrated the overall success of student outcomes in online learning but also provided educators with the information to provide quality online instruction such as interacting with students promptly and in a timely manner. Instructors motivated their students to keep communicating with other students and to support each other, thus leading to the promotion of quality teaching resulting from a dynamic online education environment. A more dynamic learning environment resulting from the ability for students and teachers to communicate with one another inherently creates a stronger support structure. This interaction allows students to have a more positive and greater chance to succeed in their online educational process (Kidd, 2005, p. 60).

Self-Efficacy in Online Learning

The literature review included a discussion on social cognitive theory (Bandura, 1986) that indicates self-efficacy strongly affects a person's decision to complete a task. The amount of effort a person is willing to commit is associated with the degree of persistence to accomplish one's plan and the ability to overcome challenges. The stronger a person's belief that he or she is able to accomplish a task, the more likely the person is willing to expend the additional effort to overcome any potential setbacks and roadblocks and accomplish the task. From an another perspective, the stronger a person's belief that he or she is able to accomplish a task, the less likely the person is going to give up when encountering a setback or obstacle (Bandura, 1997). Moreover, the review of literature filled the gaps in previous empirical research. According to Means, Toyama, Murphy, and Jones (2010), extensive literature exists on the effectiveness of online learning in which the research evidence indicates that students who promote self-reflection, self-regulation, and self-monitoring have more positive online learning results than students who do not promote self-reflection, self-regulation, and self-monitoring. However, little research exists on the degree to which students believe the quality of online instruction is associated with their engagement in online learning mechanisms through the ease of use and usefulness of CMC technologies. Bandura (1986) indicated that the implications of social cognitive and adoption theories in regard to technology engagements showed that the context can influence the beliefs of self-efficacy in an online environment. Also, self-motivation in online learning is an important factor to achieve students' educational goals (Bandura, 1997, p. 217).

Methodology

Research Design

The correlational method was the most appropriate method for this study because the purpose of the correlational study was to determine whether a relationship exists among variables (Simon, 2011, p. 61). The research was designed to study the degree to which students believe in the quality of online instruction, their perception of the ease of use and usefulness of CMC technologies, and their perception of online learning effectiveness enabling university leaders to provide the most effective CMC technology options to support students in achieving their educational goals. The research questions are as follows:

1. What effect does ease of use of CMC technologies have on students' self-efficacy in an online learning environment?

2. What is the relationship between usefulness of CMC technologies and students' self-efficacy in an online learning environment?

3. How do students' perceptions of effectiveness of online instruction using CMC technologies influence students' self-efficacy in an online learning environment?

This study included a quantitative survey research approach. The main purpose of survey research is to describe the frequency of certain characteristics among groups or populations (Singleton & Straits, 2005, p. 8). The survey is a design that provides a series of questions to the participants and summarizes their responses with percentages (Leedy & Ormrod, 2005, p. 184). This quantitative study involved using correlational and descriptive designs with existing survey instruments. The survey included Likert-type response scales to measure the degrees to which students are adopting CMC technologies.

Previous research was used to measure and retain the identical validity and reliability from previous research methods and instrumentation. Artino and McCoach (2008) created survey questions based on Bandura's (1997) self-efficacy concept. The existing survey instrument (Artino & McCoach, 2008) was used to measure students' self-efficacy in online learning. Participants were asked to consider their self-efficacy in online learning and rate nine items based on a 5-point Likert-type scale.

The analysis of survey data was conducted using the linear multiple regression and Pearson's correlation coefficient. The use of the linear multiple regression for survey data was consistent with previous studies by Artino and McCoach (2008), Bandura (1997), and Marsom (2007). The survey questions regarding the ease of use and usefulness of CMC technologies by Marsom (2007), quality of online instruction by Walker and Fraser (2005), and self-efficacy in online learning by Artino and McCoach (2008) were used as a part of the total survey instrument in this research to obtain overall construct reliability, validity, and correlation among ease of use of CMC, usefulness of CMC, quality of online instruction, and self-efficacy in online learning.

Sampling Methods and Procedures

This study included the convenience sampling method, which was efficient because the sample was derived from the availability of self-selected responders (Gay et al., 2006, p. 569). The advantage of using convenience sampling is there will be more participants in the study (Gay et al., 2006, p. 112). I was able to conduct the study at a lower cost, which makes the convenience sampling method the

preferred choice. Convenience sampling was used to recruit participants from many online universities from various geographical locations in the United States. The eligibility criteria for study participants were undergraduate and graduate students taking online courses. The selected sample were in a short period of 2 weeks using Survey Monkey and a participant pool.

A power analysis involves determining an adequate sample size for a study based on a significance level, a number of independent variables, an effect size, and 68 appropriate levels of power. The power analysis for the linear multiple regression model with three predictors, $\alpha = .05$ (two-tailed), power $(1 - \beta) = .95$, and a medium predicted effect size of $f^2 = .16$ specifies a minimal sample of 70 participants of both undergraduate and graduate students taking at least one online course.

The sample in this study was selected from Survey Monkey and a participant pool to reach the appropriate sample size. The participants responded to the survey questions regarding the ease of use and usefulness of CMC technologies and quality of online instruction to investigate if a relationship exists with students' self-efficacy in an online learning environment.

Instrumentation

The instrument was a survey questionnaire that was cross-sectional and descriptive. The instrument was a Likert-type scale in which participants responded to a series of statements by indicating whether they strongly agreed, agreed, were undecided (neutral), disagreed, or strongly disagreed (Gay et al., 2006, p. 130). The concepts measured by the instrument were the independent variables: ease of use of CMC technology, usefulness of CMC technology, and quality online instruction. The dependent variable was students' self-efficacy in online learning.

Measurement was based on scales. The measurement scale consisted of a group of related statements that participants chose from to indicate their degree of agreement or lack of agreement (Gay et al., 2006, p. 123). The participants selected answers from a table with a measurement scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*).Each participant's response was scored (Gay et al., 2006, p. 302). Nominal variables simplify persons or objects into two or more categories (Gay et al., 2006, p. 123). The source of this study's survey instrument for ease of use and usefulness of CMC technology was based on the research done by Masrom (2007). Walker and Fraser (2005) created a survey instrument to measure students' perceptions of quality online instruction. Artino and McCoach (2008) created survey questions based on Bandura's (1997) self-efficacy concept. The existing survey instrument (Artino & McCoach, 2008) served to measure students' self-efficacy in online learning.

Data Collection and Analysis

The specific step-by-step process of data collection involved using an online participant pool link, web-based survey to simplify the data collection process. The potential participants received an e-mail inviting them to participate in the survey. The e-mail explained the purpose of the survey and instructions for participation. Anonymity was ensured. The participants clicked on a hyperlink to go to the survey. Data collection took place within a 2-week period. We accessed the survey at http://www.surveymonkey.com and retrieved the data file. The data were generated into SPSS statistical analysis software. Copies of the raw data were stored for backup purposes.

Descriptive and inferential analyses were used in this study. Simon (2011) noted that descriptive research includes a correlational approach that involves collecting the data that describe the events and then organizing, tabulating, depicting, and describing the data. The descriptive statistics were conducted

using a significant test containing α = .05in a two-tailed analysis. Inferential statistics were conducted using Cronbach's alpha to check reliability to ensure both perceived ease of use and usefulness of CMC technologies are 0.89 , which is considered very good (Marom, 2007, p. 5). Pearson's product–moment correlation test was used to check for relationships among variables. Multiple regressions were used to determine whether relationships exist among ease of use and usefulness of CMC technology, quality online instruction, and students' self-efficacy in online learning.

Reliability and Validity

The processes for assessing reliability and validity of the instrument involved using various demographic characteristics such as gender, age, and level of education. The study included previously validated and reliable instruments. To measure ease of use of CMC technologies (Venkatesh & Davis, 1996), an existing survey instrument was used. To measure usefulness of CMC technologies (Venkatesh & Davis, 1996), there was also an existing survey instrument (Marom, 2007). Measuring students' perception of quality online instruction also involved an existing survey instrument. Walker and Fraser (2009) created the survey instrument to measure students' perception of quality online instruction. The instrument included 34 questions regarding instructor support, student interaction and collaboration, personal relevance, authentic learning, active learning, and student autonomy to measure the quality of online education. Another eight questions measured students' satisfaction in online learning.
Ease of use involved measuring how understandable and easy to learn CMC technologies were (Tsou, 2007). Usefulness involved measuring how helpful, effective, and diverse the communicating of CMC tools were (Tsou, 2007). Artino and McCoach (2008) created survey questions based on Bandura's (1997) self-efficacy concept. Artino and McCoach (2008)'s existing survey instrument served to measure students' self-efficacy in online learning.

Findings

Analysis and Evaluation of Research Data

The data analysis was reported in the following order:

Descriptive Statistics for Demographic Variables
Seventy online adult learners consented to participate in the study and completed the survey. There were 49 (70%) females and 21 (30%) males. Among the 70 study participants, one (1.4%) reported his or her age as 18-20; 43 (61.4%) reported their age as 21-34, and 26 (37.1%) reported their age as 35-64. Thirty-one (44.3%) study participants reported being enrolled in a bachelor's degree program; 14 (20%) reported being enrolled in a master's degree program, 24 (34.3%) reported being enrolled in a doctoral program, and one (1.4%) study participant failed to report a degree program.

Descriptive Statistics for the Independent and Dependent Variables
Table 1 shows descriptive statistics for the independent and dependent variables. Considering the smallest possible score for the independent and dependent variables was 1.0 and the maximum possible score was 5.0, all scores were relatively high on average, with averages ranging from 3.9 to 4.3. Thus, on average, the 70 study participants indicated a relatively high level of ease of use, usefulness, quality, satisfaction, and self-efficacy.

Table 1

Descriptive Statistics for the Independent and Dependent Variables

	Mean	*SD*	Min.	Max.
Ease of use	4.3393	.64835	1.00	5.00
Usefulness	3.9929	.85759	1.00	5.00
Quality—Instructor support	3.9232	.63996	1.75	5.00
Quality—Student interaction and collaboration	3.9571	.75910	1.67	5.00
Quality—Personal relevance	4.3245	.59621	2.14	5.00
Quality—Authentic learning	4.2543	.62501	2.40	5.00
Quality—Active learning	4.2095	.59024	2.67	5.00
Quality—Student autonomy	4.2286	.57714	2.40	5.00
Satisfaction	3.4250	.98687	1.00	5.00
Self-efficacy	3.9603	.67229	1.56	5.00

Cronbach's Alpha for the Independent and Dependent Variables

Cronbach's alphas were calculated for the independent and dependent variables. Table 2 shows that all scale scores had Cronbach's alphas above .7, indicating good reliability. The Cronbach's alphas ranged from .84 to .97.

Table 2

Cronbach's Alpha Reliability for the Independent and Dependent Variables

Variable	Sample size	Cronbach's alpha	Number of items
Ease of use	70	.94	4
Usefulness	70	.93	4
Quality—Instructor support	70	.93	8
Quality—Student interaction and collaboration	70	.90	6
Quality—Personal relevance	70	.93	7
Quality—Authentic learning	70	.90	5
Quality—Active learning	70	.85	3
Quality—Student autonomy	70	.84	5
Satisfaction	70	.97	8
Self-efficacy	70	.90	9

Multiple Linear Regression Analysis

To explore the relationships between the dependent variable and the independent and demographic variables further, a stepwise multiple linear regression analysis was performed. The dependent variable was the self-efficacy score. The independent variables entered into the stepwise model selection procedure were ease of use, usefulness, quality of instructor support, student interaction and collaboration, personal relevance, authentic learning, active learning, student autonomy, satisfaction, gender, age, and degree. There was only one study participant in the 18-20 age group, which was too few to analyze statistically. For purposes of this analysis, the participant was combined with the 21-34 age group. Degree program was first recoded into dummy variables. Dummy variables are dichotomous variables coded as 0 or 1. A categorical variable with *K* categories requires *K* - 1 dummy variables. Degree program had three categories: bachelor's, master's, and doctoral. Therefore, degree was recoded into two dummy variables. The bachelor's group was treated as the referent group and did not have a dummy variable. The two dummy variables for degree were defined as follows: DEG1 = 0 if degree program was not master's or 1 if master's. DEG2 = 0 if degree was not doctoral or 1 if doctoral.

Table 3 shows that quality—student autonomy was entered into the model first. The *R*-square attributed to quality—student autonomy was .374. Next, satisfaction was entered into the model, and the *R*-square attributed to satisfaction was .105. Next, ease of use was entered into the model, and the *R*-square attributed to ease of use was .041. Next, quality—active learning was entered into the model, and the *R*-square attributed to quality—active learning was .038. The *R*-square for the total model was .558, which means quality—student autonomy, satisfaction, ease of use, and quality—active learning collectively explained 55.8% of the total variance in self-efficacy scores.

Table 3

Stepwise Multiple Linear Regression Analysis

	Model[a]	Sum of squares	*df*	Mean square	*F*	*p* value
1	Regression	11.661	1	11.661	40.023	<.001[b]
	Residual	19.520	67	.291		
	Total	31.181	68			
2	Regression	14.937	2	7.468	30.344	<.001[c]
	Residual	16.244	66	.246		
	Total	31.181	68			
3	Regression	16.219	3	5.406	23.488	<.001[d]
	Residual	14.962	65	.230		
	Total	31.181	68			
4	Regression	17.402	4	4.351	20.208	<.001[e]
	Residual	13.779	64	.215		
	Total	31.181	68			

[a]Dependent variable: Self-efficacy.[b]Predictors: (Constant), quality—student autonomy; *R*-square = .374.[c]Predictors: (Constant), quality—student autonomy, satisfaction; *R*-square = .479.[d]Predictors: (Constant), quality—student autonomy, satisfaction, ease of use; *R*-square = .520.[e]Predictors: (Constant), quality—student autonomy, satisfaction, ease of use, quality—active learning; *R*-square = .558.

Table 4 shows the regression coefficients for the final model. The equation of the model was SE = -.369 + .351 * QSA + .266 * SAT + .217 * EOU + .236 * QAL, where SE = the average self-efficacy score, QSA = quality—student autonomy, SAT = satisfaction, EOU = ease of use, and QAL = quality—active learning. The interpretation of the model is, when controlling for satisfaction, ease of use, and quality—active learning, the average self-efficacy score is expected to increase by .351 points for every 1-point increase in quality—student autonomy. When controlling for quality—student autonomy, ease of use, and quality—active learning, the average self-efficacy score is expected to increase by .266 points for every 1-point increase in the satisfaction score. When controlling for quality—student autonomy, satisfaction, and quality—active learning, the average self-efficacy score is expected to increase by .217 points for every 1-point increase in the ease of use score. When controlling for quality—student autonomy, satisfaction, and ease of use, the average self-efficacy score is expected to increase by .236 points for every 1-point increase in the quality—active learning score.

In short, this analysis is self-efficacy can best be predicted by the collective contributions of satisfaction, ease of use, quality—active learning, and quality—student autonomy.

Table 4

Coefficients for Stepwise Multiple Linear Regression Analysis

Model		Unstandardized coefficients		Standardized coefficients		
		B	Std. error	Beta	*t*	Sig.
4	(Constant)	-.369	.562		-.656	.514
	Quality—Student autonomy	.351	.120	.301	2.929	.005
	Satisfaction	.266	.064	.390	4.143	.000
	Ease of use	.217	.091	.209	2.383	.020
	Quality—Active learning	.236	.101	.207	2.344	.022

[a]Dependent variable: Self-efficacy.

Examination of Research Questions and Hypotheses

The research findings were examined to determine the rejection or acceptance of the study's hypotheses.

Research Question 1: What effect does ease of use of CMC technologies have on students' self-efficacy in an online learning environment?

$H1_0$:There is no relationship between ease of use of CMC technologies and students' self-efficacy in an online learning environment.

$H1_a$: There is a relationship between ease of use of CMC technologies and students' self-efficacy in an online learning environment.

Finding 1: $H1_0$ was rejected

Null Hypothesis 1 was tested using Pearson's product–moment correlation. There was a statistically significant, moderately strong, positive correlation between the self-efficacy score and the ease-of-use score, $r(70) = .33$, $p = .005$.It was concluded that online adult students who perceive greater ease of use of CMC technologies tend to perceive a greater level of self-efficacy.

Research Question 2: What is the relationship between usefulness of CMC technologies and students' self-efficacy in an online learning environment?

$H2_0$:There is no relationship between usefulness of CMC technologies and students' self-efficacy in an online learning environment.

$H2_a$: There is a relationship between usefulness of CMC technologies and students' self-efficacy in an online learning environment.

Finding 2: $H2_0$ was rejected

Null Hypothesis 2 was tested using Pearson's product—moment correlation. A statistically significant, moderately strong, positive correlation existed between self-efficacy score and usefulness score, $r(70) =$

.32, p = .007. It was concluded that online adult students who perceive greater usefulness of CMC technologies tend to perceive a greater level of self-efficacy.

Research Question 3: How does students' perception of effectiveness of online instruction using CMC technologies influence students' self-efficacy in an online learning environment?

$H3_0$: There is no relationship between students' perception of quality of online instruction and students' self-efficacy in an online learning environment.

$H3_a$: There is a relationship between students' perception of quality of online instruction and students' self-efficacy in an online learning environment.

Finding 3: $H3_0$ was rejected

Null Hypothesis 3 was tested using Pearson's product–moment correlation. This analysis was repeated onsix measures of quality and one measure of satisfaction as follows. The results of the data analysis,$r(70)$= .43, p < .001, indicated that a strong positive correlation existed between self-efficacy and quality-instructor support. The results of the data analysis,$r(70)$= .22, p = .069, indicated there was not a statistically significant correlation between self-efficacy and quality student interaction and collaboration. It was concluded that there is no relationship between perceived quality of student interaction and collaboration with CMC technologies and self-efficacy among adult learners. The results of the data analysis,$r(70)$ = .46, p< .001, indicated that a strong positive correlation existed between self-efficacy and quality—personal relevance. The results of the data analysis,$r(70)$ = .31, p= .009, indicated that a moderately positive correlation existed between self-efficacy and quality—authentic learning. The results of the data analysis,$r(70)$ = .61, p< .009, indicated that a strong positive correlation existed between self-efficacy and quality—student autonomy. Finally, the results of the data analysis,$r(70)$ = .57, p< .001, indicated that a strong positive correlation existed between self-efficacy and satisfaction.

All three alternative hypotheses were supported. As a result, there was a statistically significant, moderately strong, positive correlation between ease of use of CMC technologies and students' self-efficacy in an online learning environment. The online adult students who perceived greater ease of use of CMC technologies tended to perceive a greater level of self-efficacy. The study also revealed a strong positive correlation between the usefulness of CMC technologies and students' self-efficacy in an online learning environment and strong evidence of a positive correlation between students' perception of quality of online instruction and their self-efficacy in an online learning environment.

The results of the study on the relationship between students' perception of quality of online instruction and their self-efficacy in online learning were consistent with Lauron (2008, p. 113), who indicated that collaboration using CMC technology can be an effective strategy in creating quality online instruction. The results of this study were consistent with LeBaron and Santos (2010, p. 10), who specified that students' beliefs in the quality of online instruction might determine the relationship between students adopting CMC technologies and self-efficacy in online learning. The results of the study were in agreement with McCollum and Abdul-Hamid (2010), who emphasized the quality of online instruction regarding some instructional practices such as continuous interaction and feedback from instructors, incorporating learning modules, encouraging multiple approaches to solve problems, and providing opportunities for collaborative learning. Lastly, the results of the study aligned with Bandura (1997, p. 247), who emphasized that students' beliefs in quality online instruction might relate to students' perceptions of online learning success.

Summary and Implications

Summary

This study filled an information gap in the literature regarding the relationship between students' comfort levels using the Internet and their satisfaction with online courses, which may relate to students' perceived learning effectiveness (Rodriguez, Ooms, & Montanez, 2008, p. 106). Yet researchers of the previous studies have not clearly measured the relationship between students engaging with CMC technologies, the degree to which students believe in the effectiveness of online instruction, and students' self-efficacy in an online learning environment. This study provided quantitative evidence of the relationships among students adopting CMC technologies, their beliefs in the quality of online instruction, and their self-efficacy in online learning as a foundation for further study on the factors that influence student success in online learning.

The findings were consistent with prior research in which the results of regression coefficients were consistent with conclusions by LeBaron and Santos (2010), who indicated that students' beliefs in the quality of online instruction were associated with their engagement in the online learning mechanism through CMC technologies. However, the findings indicated that no relationship existed between perceived quality of student interaction and collaboration with CMC technologies and self-efficacy among adult online learners. This topicmight be suggested for the further study.

This study contained some limitations. The study included data that reflected an online student population in the United States and did not contain data that represented a worldwide online student population. Therefore, the results are only generalizable to the population of online students throughout the United States. Another limitation was the cause and effect relationship among the variables was not investigated in the study. As a result, the study provided evidence of the relationships among the variables only.

Implications

The literature review indicated that students' comfort level of interactions with their instructors and other students might correlate to their success in online education. Importantly, university leaders may develop a social network among faculty and instructors, instructors with students, and students with students to support each other not only during the school year but also after graduation. This may encourage other prospective students to see the evidence of online learning success using CMC technologies to collaborate with instructors and students.

University leaders may invest time to develop a program to train students to adopt new technologies for online learning. University leaders may choose to develop more tutorials and webinars to train students using the new technologies. Such students can feel comfortable with ease of use and usefulness of modern technologies for online education.
Faculty members and instructors invest time in developing online instruction of the specific courses on a professor to student level. Instructors may collaborate with other instructors to find an effective and efficient means to communicate with their students and to relay important course work information to help students gain more confidence and self-efficacy regarding their online education success.

University leaders may encourage faculty members to develop a cohort group model for their class using CMC technologies for students to collaborate and support each other to complete a program. Cohort members may participate weekly or biweekly, depending on the instructor's guidelines. Students may then share their learning experience and motivate one another to finish the program. The cohort

members may share their lessons learned or ask questions related to their academic experience to the cohort leader and other students. A successful cohort model might be learned from other faculty members in the same and other universities.

References

Allen, E., & Seaman, J. (2010). Class differences: Online education in the United States, 2010. Retrieved from http://sloanconsortium.org/publications/survey/index.asp

Artino, A. R., & McCoach, D. B. (2008). Development and initial validation of the online learning value and self-efficacy scale. *Educational Computing Research, 38*, 279-303. doi:10.2190/EC.38.3.c

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

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

Bush, R. (2005). *Student perceptions and institution decisions of technology: The technology acceptance model* (Doctoral dissertation). Available fromProQuest Dissertations and Theses database. (UMI NO. 304938227)

Buzzetto-Moore, N. A. (2008). Student perception of various e-learning components. *Interdisciplinary Journal of E-Learning and Learning Objects*, *4*, 113-135. Retrieved from http://www.informingscience.us/Icarus /journals/ijello

Cyprus, S. (2010). What is an Internet forum?Retrieved from http://www.wisegeek.com

Davis, F. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, *13*, 319-340. doi:10.2307/249008

Edwards, J. R. (2009). *More human than human: The impact of programmed emotional cues on motivation, information processing, and perceived source credibility in computer-mediated distance learning lectures* (Doctoral dissertation). Retrieved from http://digitalcommons.uconn.edu/dissertations/AAI3370239/

Gay, L. R., Mills, G. E., & Airasian, P. (2006). *Educational research: Competencies for analysis and applications* (8th ed.). Upper Saddle River, NJ: Pearson Prentice Hall.

Kidd, T. (2005). Key aspects affecting students' perception regarding the instructional quality of online and web based courses. *International Journal of Instructional Technology and DistanceLearning*, *2*(10), 55-62. Retrieved from http://www.itdl.org/

Ku, C. G. (2009). *Extending the technology acceptance model using perceived user resources in higher education web-based online learning courses*. Orlando: University of Central Florida.

Lauron, A. G. (2008). Fostering collaboration to enhance online instruction. *Turkish Online Journal of Distance Education,5*(2), 1-14. Retrieved from http://www.icde.org/Turkish+Online+Journal+of+Distance+Education.9UFRvQYw.ips

LeBaron, J., & Santos, I. (2010). *Authentic engagement of adult learners in online learning*. Cullowhee, North Carolina: College of Education and Allied Professions Western Carolina University.

Masrom, M. (2007, May) *The technology acceptance model and the e-learning.* Paper presented at the 12th International Conference on Education, Sultan Hassanal Bolkiah Institute of Education, University Brunei, Darussalam.

McCollum, D., & Abdul-Hamid, H. (2010). *An online-instructor efficacy self-evaluation for identifying professional development needs.* College Park: University of Maryland University College.

Means, B., Toyama, Y., Murphy, R., & Jones, K. (2010). *Evaluation of evidence-based practices in online learning: A meta-analysis and review of online learning studies.* Washington, DC: U.S. Department of Education, Office of Planning, Evaluation, and Policy Development, Policy and Program Studies Service.

Naor-Elaiza, N., & Geri, N. (2009). Not as easy as e-mail: Tutors' perspective of an online assignment submission system. *Interdisciplinary Journal of E-Learning and Learning Objects,5*, 345-358.Retrieved from http://www.informingscience.us/Icarus /journals/ijello

Newman, A. (2007). Real-time computer-mediated communication: Email and instant messaging simulation. *Business Communication Quarterly,4*(70*),* 466-470.doi:10.1177/10805699070700040305

Rodriguez, M. C., Ooms, A., & Montanez, M. (2008). Students' perceptions of online-learning quality given comfort, motivation, satisfaction, and experience. *Journal of Interactive Online Learning*, *7*, 108-128.Retrieved from http://www.ncolr.org/

Rogers, E. (2003).*Diffusion of innovations* (5th ed.). New York, NY: Free Press.

Simon, M. K. (2011). *Dissertation and scholarly research: Recipes for success: A practical guide to start and complete your dissertation, thesis, or formal research project* (2nd ed.). Lexington, KY: Dissertation Success.

Stafford, T. F., & Lindsey, K. L. (2007). IP teleconferencing in the wired classroom: Gratifications for distance education. *Journal of Information Systems Education*, *18*, 227-232.Retrieved from http://jise.org/

Straub, V. (2009).Understanding technology adoption: Theory and future directions for informal learning. *Review of Educational Research, 79*, 625-649.doi:10.3102/0034654308325896

Venkatesh, V., & Davis, F. D. (1996). A model of the antecedents of perceived ease of use: Development and test. *Decision Sciences*, *27*,451-481.doi:10.1111/j.1540-5915.1996.tb01822.x

Venkatraman, M. P. (1991). The impact of innovativeness and innovation type on adoption. *Journal of Retailing*, *67*, 51-68. Retrieved from http://www.journals.elsevier.com/journal-of-retailing/

Walker, S. L., & Fraser, B. J. (2005). Development and validation of an instrument for assessing distance education learning environments in higher education: The Distance Education Learning Environments Survey (DELES). *Learning Environments Research*, *8,* 289-308. doi:10.1007/s10984-005-1568-3 _C

Yang, Y., & Cornelious, L. F. (2005). Preparing instructors for quality online instruction. *Online Journal of Distance Learning Administration, 7*, 1-16.Retrieved from http://www.westga.edu/~distance/ojdla/