AN ANALYSIS OF THE RELATIONSHIP BETWEEN INSTRUCTIONAL INTERACTION AND STUDENT PERSISTENCE IN ONLINE EDUCATION

BY

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ABSTRACT

Colleges and universities from around the world have offered various forms of distance education for many years. Most recently, the rapid development and popularity of the Internet and World Wide Web have been accompanied by a significant increase in the number of online courses and online degree offerings available from institutions of higher education. With the increase in online course offerings comes a renewed call for research establishing the quality of an online education. Although a significant body of research establishes the importance of student-teacher interaction in supporting positive student outcomes among students enrolled in on-campus, face-to-face degree programs, very few studies have examined the application of this research to online education.

This research study examined the impact of instructional interaction on student persistence among adult students in online courses. Specifically, this study examined the relationship of persistence to: (a) the frequency of instructional interaction, (b) the method of instructional interaction, and (c) student attitudes regarding interaction and their online course experience. Seven hundred sixty students enrolled in 52 online courses participated in this study. In addition, this study examined the reasons online students provided for withdrawing from, or persisting in, their online courses. Finally, this study validated a method for measuring frequency and method of instructional interaction in online courses using student reported survey data.

The results of this study indicate that student perceptions regarding the contribution of asynchronous, discussion forum use are positively correlated to course persistence rates. Student perceptions and attitudes are also positively correlated to the frequency of instructor to student interaction within a course and to the use of asynchronous methods of interaction within a course (i.e., discussion forum, email lists). Consistent with the literature on adult student dropout, the findings also identified situational and institutional barriers to persistence among students in online courses.

The findings of this study suggest that strategies to facilitate student persistence in online courses and programs should address online instructional techniques, faculty development and orientation, student orientation, technology development, and program development. Specific recommendations are included in the study as well as recommendations for future research.

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CHAPTER I

INTRODUCTION TO THE STUDY

Introduction

The growth and popularity of the Internet and the World Wide Web on the part of students and faculty at institutions of higher education across the country has coincided with the development and expansion of online distance education programs by colleges, universities, private companies and consortiums. A 1998 survey conducted by the National Center for Education Statistics (Lewis, Snow, Farris & Levine, 1999), estimated 54,479 different distance education courses were offered with an enrollment of approximately 1,661,100 students. These figures represent an increase of over 100% from the 1994-95 statistics of 25,730 distance education courses, and an enrollment of 758,640 students. Numerous public colleges and universities across the country are developing online certificate and degree programs, increasing students' access to higher education.

Online distance education programs provide unique educational opportunities to non-traditional, adult students who are often faced with limitations on their time and ability to commute to and from a college or university campus (Arenson, 1998a; Rahm & Reed, 1997). The expanded access that online programs provide adult students is becoming increasingly important as the adult learner population grows. The 1996 US

Census indicates that undergraduate and graduate college students are getting older, with a much faster population growth rate in the 25 – 40 year old category than in the 17-24 year old age group (Zernike, 1999). This older college population has numerous professional and family responsibilities. It is often difficult for working adults to travel to campus to attend class during the time frames typically offered by most institutions of higher education (e.g., Mon. – Fri., 9AM – 5PM or evenings from 6PM – 9PM). These adult students require and often demand a more flexible, accessible learning model. Online distance education programs address the needs of adult students who wish to further their college education (Hanna & Associates, 2000; Verduin & Clark, 1991)

As institutions of higher education launch or expand distance learning course offerings, it is important to identify strategies and techniques that promote student participation in online distance learning programs. While a number of studies suggest that there is "No Significant Difference" in grades or final evaluations between students in conventional face-to-face classrooms (FTF) and those enrolled in various forms of correspondence and distance learning courses (e.g. online courses, one-way video, two-way video) (Russell, 1999; Spooner, Jordan, Agozzine, & Spooner, 1999; Verduin & Clark, 1991; Wideman & Owston, 1999), these types of comparison studies do not typically identify and test "best practices" or teaching strategies that promote student achievement, satisfaction and persistence (Phipps & Merisotis, 1999; Smith & Dillon 1999).

One factor that is consistently identified as contributing to student achievement, satisfaction and persistence in FTF college classrooms is interaction. A significant body of research literature documents the role of student and faculty interaction in supporting

positive learner outcomes on the traditional college and university campus (Kuh & Hu, 2001; Pascarella, Terenzini & Hibel, 1978; Tinto, 1987). However, very few recent studies examine the relationship between student-faculty interaction and student achievement, satisfaction or persistence in online classrooms (Phipps & Merisotis, 1999). In fact, in their review of the "No Significant Difference" research literature, Phipps and Merisotis suggest the need to expand and improve research that attempts to identify factors which contribute to student achievement and persistence in an online course.

Drawing on established research in the areas of student retention and persistence, adult learning theory and interaction in online courses, this research study examined the relationship between instructional interaction and student persistence in online courses. Specifically, this correlational study asked if there is a relationship between the frequency and method of instructional interaction among adult students in online courses and student persistence in these courses. The researcher theorized that the frequency and method of instructional interaction in an online course is positively correlated to student persistence.

Statement of the Problem

In 1999, the Institute for Higher Education Policy (Phipps & Merisotis) released a report critical of distance learning research to date. This report reviewed research on a range of distance education delivery systems (e.g., one-way video, two-way video, online courses), identified a number of weaknesses with this research, and suggested additional avenues of research. Among the weaknesses identified in the report were: (a)

an inadequate explanation of why the dropout rates of distance learners are higher than face-to-face campus-based learners, (b) a lack of research on the impact of the use of multiple technologies, (c) an emphasis on student outcomes for individual courses rather than academic programs, and (d) a limited theoretical or conceptual framework.

Phipps and Merisotis' finding suggesting large differences in the dropout rates of distance learners as compared to FTF campus-based learners was based on their review of multiple studies, some using different distance learning delivery systems, some using different research methodologies, while others used different definitions of dropout and attrition. While some studies and the popular press report significantly higher dropout rates among distance learners than experienced by FTF students (Breslin, 2000; Garrison, 1987; Verduin & Clark, 1991), other reports, and this researcher's experience, suggest that the dropout rates among online learners is comparable to or less than that experienced in FTF classes (B. Oakley, personal communication, June 13, 2000; J. Sener, personal communication, June 13, 2000). What this discrepancy in findings suggests is the need to first clearly define dropout, or conversely, persistence, and then to clearly define the research methodology.

While there may be disagreement regarding the definition and extent of dropout rates among distance and FTF learners, the literature strongly supports the importance of student persistence among both distance and FTF learners. Persistence is a measure of a student's commitment to complete a course or educational program (Cookson, 1988; Fjortoft, 1995; Sweet, 1986; Taylor, 1986). The decision to persist or drop out of a course or educational program is reflective of multiple factors that are discussed in Chapter II. Persistence is considered an attribute of learner success, associated with

student satisfaction (Cookson, 1988; Noel, 1985), academic achievement (Anderson, 1985), and goal attainment (Tinto, 1985). From this perspective, persistence provides an important overall quantitative measure of the effectiveness of an educational program in meeting the individual learning needs of students. Garrison (1987) and Sweet (1986) suggest the examination of persistence is important to the field of distance education in order to demonstrate that various forms of distance education are effective, viable methods for delivering education and to inform program design and delivery based on a better understanding of the distance learner.

The literature on student retention and student persistence at the undergraduate level indicates that interaction between faculty and students, as well as interaction among students, is an important factor in supporting student retention (Braxton, Milem & Sullivan, 2000; Tinto, 1987). A number of theorists and researchers have studied student retention and persistence in FTF classes among traditional undergraduate students (18 – 22 years old) on residential and commuter colleges and universities (Kuh & Hu,2001; Pascarella & Chapman, 1983 ; Pascarella et al., 1978; Tinto, 1987; Woodley & Parlett, 1983). These studies suggest that in-class (formal) and out-of-class (informal) interactions with faculty regarding academic or career related topics is positively related to student achievement and student retention. In these studies interaction is very broadly defined to reflect a range of in-class or out-of-class communications between students and faculty, or among students, that may be of a course or non-course related topic. The application of this broad definition of interaction to adult students enrolled in online learning programs warrants closer examination.

First, much of the research conducted on the impact of formal and informal interaction on learning outcomes such as student achievement and student retention was conducted on 18 – 22 year old students enrolled in undergraduate programs at residential colleges and universities. The opportunity for informal, social interactions with faculty and fellow students in these environments is much greater than at a commuter school or among adult students engaged in continuing education. Several studies conducted with commuter school populations found no significant correlation between informal, social interaction and learner outcomes, while formal interaction remained a significant correlate of positive learner outcomes, consistent with traditional, residential campus findings (Braxton & Brier, 1989; Pascarella & Chapman 1983; Pascarella, Duby & Iverson, 1983). The findings of these studies suggest that research regarding student-faculty interactions among commuter students is best focused on formal student-faculty interactions.

Like commuter students, adult students enrolled in online courses are also less likely to participate in informal, social interactions with faculty and fellow students. Since the opportunities for informal social interactions among students and faculty are very limited among commuter and distance education students, an operational definition of interaction for this study should focus primarily on formal, course-related, interactions.

A second issue is related to the differences between the methods of interaction available in a FTF classroom versus an online classroom. In a FTF classroom, the learner and instructor can interact through a variety of verbal, visual and physical means. Instructors and students can talk, exchange facial expressions or physically posture to

make a point. The communication typically occurs in real-time, and an immediate response or acknowledgement is expected. In an online classroom, interaction is filtered, most often through a text-based message, sometimes accompanied by a graphic or a brief audio/video exchange. The exchange may occur in real-time, as in a chat room, or may occur asynchronously, providing the author and respondent time to reflect on questions and comments before responding. Interaction methods change in an online classroom restricting some aspects of real-time communication, but also enhancing opportunities for reflective communication. The impact of these various methods of online communication should be factored into any definition and study of interaction when applied to online classrooms.

A third issue associated with studies based on a population of 18- 22 year olds is the difference between traditional and adult students. Adult students typically bring a different set of life experiences, motivations, expectations and outside commitments to the learning experience than the traditional 18-22 year old undergraduate (Cookson, 1988; Cross, 1981; Knowles, Holton & Swanson, 1998). These different characteristics and factors shape the adult students' learning experience and may influence their ability to interact with faculty, their preference for interaction, and their rate of student persistence. Any rigorous study involving adult students must account for these situational and dispositional influences (Fjortoft, 1995).

This study addressed the concerns raised above by first providing a functional definition of instructional interaction that narrowed the scope of the term to reflect the communications options available to students enrolled in online courses. This study then measured the frequency and method of instructional interaction across a range of online

courses. These data were used to examine the relationship between instructional interaction and student persistence in these courses. Telephone surveys and mail surveys were conducted with students who dropped out of their online course in order to identify whether or not instructional interaction was a reason for dropout provided by students who failed to persist. This study also examined demographic and situational characteristics of adult students who persisted in their online course and those who dropped out of their online course. These data were used to identify differences between student populations in the study and to identify differences between students who persisted and those who dropped out.

Purpose of the Study

The purpose of this study was to examine the impact of instructional interaction on student persistence among adult students in online courses. Specifically, this study examined the relationship of the frequency of instructional interaction and the method of instructional interaction to levels of student persistence in online courses. The literature on student retention and student persistence at the undergraduate level indicates that interaction between faculty and students as well as interaction among students is an important factor in supporting student achievement (Kuh & Hu, 2001; Pascarella et al., 1978; Woodside, Wong & West, 1999), student satisfaction (Pascarella & Terenzini,1976) and student retention (Braxton et al., 2000; Tinto 1987). Drawing on the broad literature base established by researchers in the area of traditional, undergraduate student retention and persistence, this study examined the application of this research to adult students in online education programs.

Furthermore, this researcher's own experience in developing and monitoring student and faculty interaction in an online distance learning program for adult students at the undergraduate and graduate level suggests that the frequency and method of student and faculty instructional interaction is related to students' reported satisfaction with their courses and to the students' decision to stay enrolled in and complete particular courses. This observation is based on both previous programmatic review of student evaluations of online courses in the distance learning program and anecdotal conversations with students who contact the institution regarding the frequency and quality of student-instructor communications. While the institution had not previously conducted a correlational study examining the relationship between instructional interaction, student satisfaction and student persistence, an often expressed concern by students dropping courses after the initial Add/Drop period was that they did not receive prompt responses or adequate feedback to their course-related questions and assignments.

This study examined the relationship between instructional interaction and student persistence through a framework of inquiry established by the following research questions:

Question 1. Is there a relationship between the frequency of instructional interaction and levels of student persistence in online courses?

Question 2. Is there a relationship between the method of instructional interaction and student persistence in online courses?

Question 3. Do the reasons students provide for failure to persist in online courses differ based on the frequency or method of instructional interaction?

Question 4. Do other variables emerge as correlates of persistence among students in online courses?

Conceptual Frameworks

The conceptual framework applied to this study was based on the work of researchers in the areas of student-faculty interaction, interaction in distance education, characteristics of adult students and student persistence. A conceptual map providing an overview of the study will be presented first, followed by an introduction to each topic. A more extensive discussion of the literature pertaining to these areas of research is contained in Chapter II.

Conceptual Map

This study examined the relationship between instructional interaction, the independent variable, and student persistence, the dependent variable, among adult students in online courses. The researcher hypothesized that frequency of instructional interaction was positively correlated to student persistence and that method of instructional interaction (asynchronous or synchronous) was also related to student persistence. Figure 1 provides an illustration of the proposed relationship between study variables. Instructional Interaction, on the left of Figure 1, was the independent variable. The method of interaction (asynchronous, synchronous) and the frequency of interaction represented levels of the independent variable. Barriers to persistence, on the right of Figure 1, represented other factors known to influence an adult student's decision to persist in a course or program of study. Persistence, at the top left of Figure 1, was the outcome measure for the study.

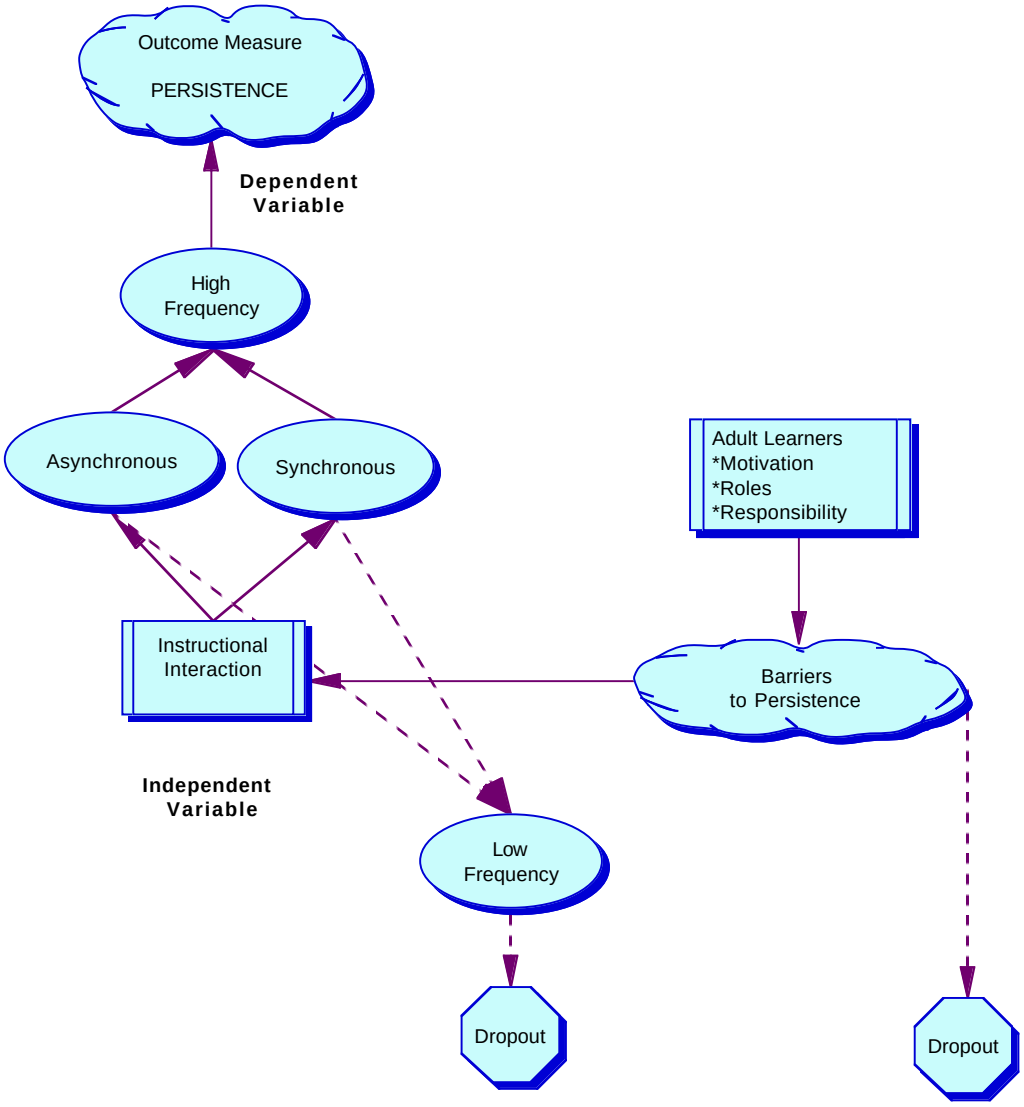


Figure 1. Proposed relationship between Instructional Interaction, Adult Students and Persistence.

Through an examination of course interaction records, student reports and course retention rates, the researcher developed course-based measures of the frequency of instructional interaction, method of instructional interaction and level of persistence.

These measures were then used to conduct statistically appropriate correlational tests to determine the existence and strength of relationships between the independent variable, instructional interaction, and the dependent variable, persistence.

The unit of analysis in this study was the course; however, the data collected to measure levels of the independent and dependent variables for each course were collected from individual students and then grouped at the course level. For example, frequency of instructional interaction data was collected through individual student surveys and a mean frequency of instructional interaction score was then calculated for each course. Course persistence rates provided a course-level measure of each student's decision to complete or drop out of their online course. For this reason, it was also important to consider the characteristics of the student population and how these characteristics may have intervened in the study.

The review of the literature discussed in Chapter II suggests that adult students are a unique student population, distinct from traditional 18-22 year old college students. As a unique population, adult students typically present different primary and secondary role responsibilities, different motivations for furthering their education, and different levels of engagement in education than the traditional 18-22 year old college student (Cross, 1981; Pappas & Loring, 1985). Adult students are also confronted with a unique set of barriers to participation in educational opportunities (Cross, 1981). While this study was focused primarily on examining the role of instructional interaction in supporting student persistence in online courses, it was important to consider the impact of adult learner characteristics and educational barriers on respondents' decisions whether or not

to persist in their online course. The characteristics and barriers were treated as control variables in this study.

Instructional Interaction

The importance of interaction between students and faculty in supporting positive learner outcomes in campus-based undergraduate education is well documented. Researchers have identified formal (academic) and informal (social) interaction between instructors and undergraduate students as well as interaction among students as important factors in supporting student achievement (Kuh & Hu, 2001; Pascarella & Terenzini, 1976; Pascarella et al., 1978), student retention, and degree completion (Tinto, 1987) among traditional, undergraduate students in campus-based undergraduate programs. In these campus-based studies, interaction is very broadly defined to reflect a range of in-class or out-of-class communications between students and faculty, or among students, that may be of a course or non-course related topic. While on-campus research to date establishes the impact of student-teacher interaction on student achievement, retention, and degree completion, the broad definition of interaction used by these researchers needed to be more closely refined to reflect the communication dynamic that occurs between faculty and students in online education.

For the purposes of this study, instructional interaction was defined as directed communication regarding course content and topics between the instructor and students or among students in the online course. This definition focused the study of interaction on communication between course participants and the instructor regarding course content. This definition is consistent with previous researchers' efforts to refine the

definition of interaction to reflect the communication process that occurs between learner-learner, learner-instructor and learner-content (Moore, 1989; Wagner, 1994).

In addition to focusing the definition of interaction on the communication process, the emergence of different methods of communication in online courses suggested the need to specify the method of interaction. This is important since different technology-supported methods of interaction (e.g., two-way interactive TV, text-based chat, email) have different characteristics in regard to immediacy of feedback, realism and student user control (Smith & Dillon, 1999). This study examined online education in courses that supported both synchronous (simultaneous) and asynchronous (delayed) methods of interaction. This distinction regarding the method of interaction is important since it affects the provision of feedback to the learner, a concept identified as critical to the learning process (Kearsley, 1995; Smith & Dillon). Distance learning environments that support synchronous interaction can provide immediate feedback to the learners, a feature that may serve to motivate some learners (Moore & Kearsley, 1995). Distance learning environments that support asynchronous interaction can provide the learner with more control over where and when the instructional interaction occurs as well as provide the learner with more time to reflect on and respond to course content and communications (Moore & Kearsley).

Characteristics of Adult Students

The student population participating in this study was composed primarily of adults enrolled in online courses offered by a continuing education division at a major public university. The overwhelming majority of students enrolled in this program are

age 25 or older (85% in the Fall 2001 semester, 87% in the Spring 2001 semester, 90% in the Fall 2000 semester). This age range is consistent with the literature that finds adults, aged 25 or older, compose the majority of students enrolled in continuing education programs. Since the study sample was drawn from a population of adult students, it is important to consider how the characteristics of adult students related to the outcome measure in this study, student persistence, and what reasons other than interaction may have contributed to the adult student's decision to drop out. The research design measured these variables.

Three particularly useful distinctions made in the literature between adult students and the traditional 18-22 year old college student include: (a) Adults are typically part-time students with multiple responsibilities in life, (b) adults are typically volunteer students; and (c) adults are motivated by goal/career oriented reasons, socially oriented reasons or learning oriented reasons (Cross, 1981; Pappas & Loring, 1985).

As part-time students with multiple responsibilities, the student role fulfilled by adults tends to be secondary to other roles as family members, worker and community members (Pappas & Loring, 1985; Kerka, 1989). This distinction has particular implications when discussing adult student dropout and persistence since these other primary roles place demands on adults that may interfere with their ability to complete a course or program of study.

A second important distinction of adult students is that they are typically volunteer students. Adult education is not mandatory in the sense of K – 12 education, nor is it expected that working adults will attend a four-year college in the same way this is expected of high school graduates. The fact that adult students are volunteers suggests

that they can start, stop, and restart their education for a multitude of reasons (Kerka, 1995). This ability or characteristic on the part of volunteer, adult students to enter and withdraw from a course or program has an impact on how any study measures dropout or persistence and how to best categorize or group adult students.

A third important distinction of adult students are the motivating factors that prompt adults to pursue educational opportunities. The choice to voluntarily pursue an education suggests a different set of motivations from the traditional undergraduate college student (Knowles, 1970). The literature identifies three categories of reasons adults provide for pursuing an education. These include goal or career oriented reasons, activity or socially oriented reasons and learning oriented reasons (Cross, 1981; Houle, 1961; Knowles, Holton & Swanson, 1998; Tough, 1968). While researchers have identified sets of motivations for why adults further their education, the research to date does not indicate whether one set of motivations is more compelling, or results in, greater learner persistence than another set of motivations.

The literature has also identified many reasons why adults choose to discontinue or not to participate in continuing education. Following an extensive review of the literature, Cross has categorized these reasons into situational barriers, institutional barriers and dispositional barriers. Situational barriers arise from a student's life situation and can include cost, lack of time, family responsibilities and job responsibilities. Dispositional barriers are related to a student's attitudes and self-perceptions as a learner. Institutional barriers include institutional policies and practices that impede adult participation. Examples include inconvenient course times, extensive prerequisites or program requirements, inconvenient location and time required to complete a program.

Given the anytime/anywhere aspect of online education, the potential for addressing the inconvenient time and location barriers often cited by adult students is quite real. The impact of online learning on other situational and dispositional barriers has yet to be studied.

Any program which attempts to provide educational opportunities to adults must be cognizant of the above characteristics of adult students and the barriers they face in order to: a) meet the diverse or unique needs of adult students and b) sustain enrollments sufficient to support the development and operation of the program. This study, while focused on the impact that one variable, instructional interaction, may have on adult student persistence, examined the impact that other variables may have had on the adult student's decision to persist in an educational endeavor. This study's research design controlled for barriers to participation and adult student characteristics by collecting data regarding these factors from students who persisted and who dropped out and then mapped this data to students' intentions to take future online courses.

Persistence

A growing body of research exists pertaining to dropout and persistence among students enrolled in higher education. The definitions of dropout and persistence vary somewhat based on the population under examination. Typically researchers and institutions discuss persistence with a longitudinal approach, examining students' progress toward attainment of a degree over the course of several years. This approach is reasonable when the student intends to complete a degree; however, as discussed above, adult students have different sets of motivations and responsibilities. Some intend

to complete a degree, some a certificate, some a whole course, and some a segment of a course. Given the diverse reasons adults choose to continue their education, it is important to consider persistence through a cross-sectional approach, examining per course completion rates and student intention to take another course (Pappas & Loring, 1985).

Since the population for this study is primarily adult students, traditional definitions of persistence and retention must be broadened to account for the different academic objectives of adult students. For purposes of this study, student persistence was defined as a student's commitment to: a) complete the online course currently enrolled in and b) continue his or her studies in the online program during the subsequent semester. Persistence was measured by an examination of each course's enrollment rosters at the beginning, mid-point and end of the semester. A second measure of persistence, intent to return, was measured by the online survey among students who indicated they had additional courses to complete in the subsequent semester. Persistence is considered a positive outcome measure as compared to dropout, which is the negative equivalent outcome (Cookson, 1988).

Cookson (1988) suggests that most studies of persistence in distance education consist of student profiles, studies of institutional factors and studies of student reasons for persisting or dropping out. While these types of studies may prove useful in describing students who are likely, or unlikely, to complete an online course, they do not typically identify strategies faculty and institutions can engage to increase student persistence.

Garrison (1987) suggests that the study of mediated communication, a distinguishing factor of all forms of distance education, is a critical factor in understanding persistence and dropout in distance education. He recommends the study of various aspects of mediated communication (i.e., speed and frequency of feedback, pacing of feedback, types and combinations of distance education delivery, contact among students) in relationship to persistence. Garrison's emphasis on the study of various aspects of mediated communication is echoed by other researchers (Hawkes, 1996; Main & Rilse, 1994; Smith & Dillon, 1999). This study addressed Garrison's recommendation by examining the relationship between the frequency and method of instructional interaction in online courses and student persistence.

Definition of Terms

Adult Learner. The term adult learner refers quite broadly to adults engaged in the process of gaining knowledge and expertise through informal and formal educational activities (Cross, 1981; Knowles et al., 1998; Tough, 1968). These educational activities may be self-directed or guided by another person (Tough, 1978). They may be for academic credit and degrees, for non-credit personal development and enrichment, for work-related training or advancement, or for the achievement of basic educational skills (e.g., English as a Second Language, Adult Basic Education) (Cross, 1981; Knowles et al., 1998; Kwang & Creighton, 1999).

The primary characteristics of adult students include:

1. Voluntary, rather than mandated, participation in the learning process (Marineau & Chickering, 1982);

2. Interest in the application of learning and knowledge to their non-school life (Cross, 1981; Knowles, 1970);

3. Student role secondary to family or occupational role (Pappas & Loring, 1985);

4. Participation in a part-time or alternative learning program in order to accommodate other adult roles (Marineau & Chickering, 1982; Pappas & Loring, 1985).

This research study focused on students enrolled in undergraduate and graduate online programs; therefore, the operational definition of adult students focused on adults participating in instructor-led undergraduate and graduate online courses. For the purposes of this study, it was appropriate to make a distinction between traditional, 18 to 22 year old undergraduate college students enrolled full-time in an on-campus degree program and over 22 year old adult students continuing their education on a full or part-time basis through a continuing education, extension school or alternative learning program. The responses of under-22 year old students did not affect the interaction data or the enrollment data.

Asynchronous Interaction. A delayed time communication, typically in text format, between the learner and instructor or among learners. Asynchronous interactions allow the learner and instructor to read and respond to the communications at some later time and date (Anderson & Garrison, 1998; Collison, Elbaum, Havind & Tinker, 2000).

Discussion Forum. An asynchronous communication tool where participants can post text-based messages and attachments on a course website for others to view and comment on at any time of the day (Collison et al., 2000).

Distance Education. "an educational process that is characterized by the separation, in time or place, between instructor and student. Such term may include courses offered principally through the use of (1) television, audio, or computer transmission, such as open broadcast, closed circuit, cable, microwave, or satellites transmission; (2) audio or computer conferencing; (3) video cassettes or disks; of (4) correspondence." (Amendments to the Higher Education Act of 1965, 1998, P.O. 105-244, Title IV, Part G, Section 488).

Email**.** An asynchronous communication tool where students and the instructor can send and receive text-based messages and attachments to and from each other at any time (Harasim, Hiltz, Teles & Turoff, 1996).

Interaction. Reciprocal communication events between at least two objects that require at least two actions (Wagner ,1994).

Instructional Interaction. Communication between student and instructor, or between two or more students, which discusses some aspect of course content, assignment or student progress in the course or program (Kearsley, 1995; Wagner, 1994).

Learning Management System**.** A software-based system for managing the development and delivery of online courses and programs and managing student progress over the Internet (Smith, Murphy & Teng, 2001).

Online Chat. A synchronous communication tool where participants are online at the same time and can communicate immediately with each other using text-based messages and attachments (Salmon, 2000).

Student Persistence. For purposes of this study student persistence was defined as a student's commitment to: a) complete the online course enrolled in during the research period by the end of the then current semester and/or b) continue his or her studies in the online program during the subsequent semester (Cookson ,1988).

Synchronous Communication. A real-time or simultaneous communication between the learner and instructor or among learners (Anderson & Garrison, 1998; Collison et al., 2000).

Overview of the Study

This study examined the impact of instructional interaction on student persistence among adult students in online courses. The population for this study included approximately 1600 adult students enrolled in 76 undergraduate and graduate online courses offered as part of an online distance learning program operated by the continuing education division of a major public university. Instructional Interaction, the independent variable in this study, was examined through administration of a survey tool that asked respondents to report the frequency and method of instructional interaction experienced in their online course. Student persistence, the dependent variable in this study, was measured through the administration of a survey tool, through a review of each online course's enrollment records, and through telephone interviews and mail surveys with students who withdrew from an online course during the study.

For the purposes of this study, instructional interaction was defined as directed communication regarding course content and topics between the instructor and students or among students in the online course. The method of instructional interaction used in the online course was based on the communication tools supported in the online course management system in use at the time of the study (i.e., IntraLearn). Communication tools available to students and instructors enrolled in the online courses under study included online chat, online discussion forum and email.

The literature defines student persistence as a student's commitment to continue and complete an academic course of study. Since much of the research regarding student persistence has previously been conducted with undergraduate students enrolled as freshman in two or four year colleges and universities, the definition of academic course of study primarily refers to a two or four year degree program. Since the population for this study was primarily adult students, traditional definitions of persistence and retention, had to be broadened to account for the different academic objectives of adult students. For purposes of this study student persistence was defined as a student's commitment to: a) complete the online course enrolled in during the study semester and/or b) continue his or her studies in the online program during the subsequent semester.

The unit of analysis in this study was each online course. The researcher administered an online survey tool at the end of the Fall 2001 semester to students in the online courses selected to participate in the study (selection criteria detailed in Chapter III). This survey tool asked students to report their experience with the frequency and method of instructional interaction, student demographic and situational characteristics

and student intent to enroll in future online courses. The instructional interaction data collected through the survey were then used to calculate an overall frequency of interaction measure for each course and to categorize online courses according to the primary method of instructional interaction (chat, discussion, email, combinations of each).

In addition to surveying students who maintained enrollment in the course throughout the semester, the researcher reviewed enrollment records to: a) identify enrollment and dropout rates for each online course and b) identify students who withdrew, failed or took an incomplete in the course. The enrollment and dropout data were used to calculate a retention rate per course. Each courses' retention rate was compared across courses based on method of instructional interaction and frequency of instructional interaction in an effort to identify differences in retention as it related to the method and frequency of instructional interaction.

The student identity data were used to contact students who withdrew from, failed, or took an incomplete in a participating course during the Fall 2001 semester. All students who administratively withdrew from their online course were asked to participate in a brief telephone survey. This survey asked students to identify their reasons for not completing the online course, their intentions regarding subsequent online courses, and to provide student characteristics data such as age, gender, and online experience. The data collected by this survey was used to: (a) identify student reasons for withdrawing from their online courses, (b) identify student intentions regarding enrollment in subsequent online courses, and (c) compare characteristics of

students who completed their online course to those who withdrew from their online course.

Significance of the Study

The study made several significant contributions to research in the areas of educational technology and adult education. First, this researcher developed and tested a reliable procedure for identifying the frequency and method of interaction that occurs within an online classroom through the collection of student-reported survey data. This procedure contributes to the research and assessment tools available to researchers in the field of online teaching and learning.

Next, this study contributed to the emerging body of research regarding persistence among adult students, extending the implications of earlier campus-based studies to virtual, online courses. While the popular press and some researchers claim that online education and distance education in general have very high dropout rates, this researcher found that the program under examination had very high student persistence and, therefore, very low dropout rates. This study provided insight into the characteristics of students who persist in online courses and those who do not. This information may prove useful to other researchers, online faculty, and online programs as they attempt to recruit and retain adult online students.

A popular line of distance education research focuses on comparison studies of online students to on-campus students in a specific course. This study proposed and tested a methodology for moving beyond comparison studies to examine more closely what occurs in an online course while examining the course phenomenon across an

entire online program. This research suggests the need to broaden the focus of course-based studies across multiple programs at different institutions.

If one accepts the well-documented principle that interaction with faculty and fellow students is a critical factor in supporting student persistence on undergraduate college and university campuses, it is important to understand the implications of interaction on student persistence in online education where the methods of interaction are modified by the use of technology. This study contributed to a further dialogue regarding the relationship between interaction, student persistence and student attitudes in online courses.

Research informs practice. If interaction is a critical component of the learning experience in a classroom, it is important to understand whether or not the role of interaction is important in an online classroom. Once researchers have a clearer, documented understanding of the role interaction plays in supporting persistence in an online classroom, they can then develop research-based policies regarding how instructors might structure interactions in online classrooms to best support student learning.

As institutions of higher education face increasing pressure to expand online education programs, the need to train faculty in the development and teaching of online courses becomes increasingly important. Research regarding the best or most effective strategies for facilitating interactions which support learning could facilitate the adoption of online teaching strategies by faculty new to the online environment, thereby, alleviating some of the frustration faculty and students experience when faculty try to learn how to teach “on the job”. Kearsley estimates a response time of 10 hours per

week if an online instructor spends 20 minutes per student when responding to one weekly assignment for an online course of 30 students (1994, p. 89). Given the many demands on faculty time, including course development, course management, research, outreach and teaching, it is critical that faculty and administrators understand the value of interaction in online classrooms. From a cost/benefits perspective, it is important for faculty and administrators to understand which group of learners will benefit from various teaching strategies and types of interactions.

Limitations of the Study

This study was conducted at one institution using one type of distance education delivery, computer-based online education, within a specific learning management system. These factors limit the generalizability of findings to other institutions and other forms of course design and distribution. However, it is important to note that Tinto's theory of student dropout attempts to explain student departure at a given college or university and in this respect the application of Tinto's theory to this study is quite appropriate.

The use of online learning to deliver courses and degree programs to adult students is a relatively new phenomenon. Student and faculty use of this technology, specifically in regard to student-faculty interaction, may change as students and faculty become increasingly accustomed to the use of online technology in general and the specific learning management system in particular. This factor suggests a limit on the generalizability of these findings to other student-faculty populations with different levels of technical experience.

The lack of random assignment of treatment groups is a threat to internal validity; however, this is not uncommon in educational research. The researcher attempted to include all cases that met the research and response rate criteria for the study. It is possible that students interested in or supportive of distance education tend to enroll in online courses more than those who are not supportive, possibly skewing responses on the student survey.

The lack of a control group limits the ability to examine causation. This study examined phenomena within an online course environment and is not attempting to compare results across environments; hence, the lack of a control group should not pose a significant threat to internal validity. The courses selected to participate in the study represented a broad range of academic majors, however, not all majors were included. This limit regarding the disciplines currently online at this particular institution limits the ability to generalize results to other disciplines.

The survey research method relied on student self-report of data to develop a snapshot of the frequency and method of interaction used in each course. This method relies on the student's ability or willingness to recall and provide accurate data. The design of the learning management system allowed the researcher to cross-reference the student self-report data against each courses' communications record. The researcher cross-referenced a subset of the interaction data to match the reliability of student self-report data regarding interaction against actual course communications archives and found the student reported data to be in agreement with the course archives.

"Intent to Return" constitutes a proxy measure for actual student persistence so it is a measure of student intention rather than an actual measure of persistence. However,

previous researchers have established a strong correlation between student intentions and actual persistence rates (Braxton et al., 2000; Pascarella et al., 1983). While intent to return was used as a measure between persister and non-persister student groups, the course persistence rate was used for all correlational analysis.

CHAPTER II

REVIEW OF THE LITERATURE

Introduction

This chapter further explores the conceptual framework introduced in Chapter I, outlining the theoretical basis for the study and describing how previous research supports the hypothesized linkage between instructional interaction and student persistence in online education. Since the conceptual framework for this study is based on research in the areas of distance education, online education and interaction, these topics will serve as the main organizing points for the discussion that follows.

Online Education

Online education (Kearsley, 2000), also referred to as web-based instruction (Khan, 1997), and web-based training (Driscoll, 1998), is one among several methods of distance education. Before discussing characteristics of online education, an understanding of distance education in general is appropriate.

Distance Education Overview

In a broad sense, distance education refers to "any formal approach to learning in which a majority of the instruction occurs while educator and learner are at a distance from one another" (Verduin & Clark, 1991, p. 8). Online courses, two-way interactive television, one-way satellite television, cable television broadcasts, and even print-based correspondence courses each represent different methods of facilitating distance education (Mielke, 1999). Verduin and Clark, revising Keegan's 1986 definition of distance education, identify four defining characteristics of distance education. These include:

1. Physical separation of teacher and learner during a majority of the instructional process;

2. Influence of an educational organization, including the provision of student evaluation;

3. Use of educational media to unite teacher and learner and carry course content;

4. Provision of two-way communication between teacher, tutor, or educational agency and learner (p. 11).

The emergence of various communications technologies over the past 25 years has served to facilitate communications between teacher and distance students as well as support the presentation of educational media. The telephone, broadcast television, two-way interactive television, computers and the Internet have all been used to deliver distance education programs (Stewart, 1995; Verduin & Clark, 1991). The use of technology to support communications and delivery has become a defining characteristic

of distance education (Garrison 1987; Moore & Thompson, 1997; Verduin & Clark, 1991).

While many definitions of distance education note the physical separation of student and teacher, it is also important to note that students and teacher may be separated by time, unable to attend class at the same time each week. While distance education programs utilizing audio conferencing and interactive television typically require students to attend class in specific remote site classrooms at specific times, emerging Internet-based programs allow students to attend classes from their home or office computer. Technologies such as email and computer bulletin boards support asynchronous communication, allowing students and teacher to communicate and review course materials at a time convenient to them. Technologies such as desktop videoconferencing and text-based chat support synchronous communication, providing immediate feedback while requiring a simultaneous communication (Moore & Kearsley, 1995; Romiszowski, 1993).

Research to date suggests that students participate in distance education because it provides greater access and flexibility than campus-based programs (Thompson, 1998). In a study of television-based distance education, Hezel and Dirr (1991) found that distance from campus was a significant barrier to participation in a campus-based program for 75% of the students surveyed. Online distance education reduces geographic boundaries by allowing students to participate in class from wherever they have a computer and Internet connection.

Limitations of time have also been identified as reasons students participate in distance education. Separate student samples in two studies regarding the barriers to

participation in on-campus education found that a large majority of student respondents (82% - 95%) identified time constraints as an important reason for enrolling in telecourses (Hezel & Dirr, 1991; Liviertos & Frank, 1992). Online distance education addresses time limitations by allowing students to access course materials, their instructors and fellow students at any time of the day or night, using a variety of asynchronous and synchronous communication tools. By increasing the period of time during which students can participate in class, online programs increase the opportunities for students to attend class beyond the traditional 9 AM to 10 PM on-campus day and evening programs.

While increasing access to education is an important characteristic of both distance and online education, it is also important to consider the pedagogical impact of online education. Kearsley (1998), Knowlton (2000) and others (Harasim et al., 1996; Palloff & Pratt, 1999; Salmon, 2000) suggest that online education promotes a change in roles for teachers, moving from the central role of director of the classroom to a role of facilitator or guide. This new role requires the teacher to guide students to resources, facilitate discussion and interaction and encourage student participation. Kearsley states that "Any teacher or expert who tries to 'lecture' to an online group will quickly have them tuning out and doing other things (like sending messages to each other or forming their own discussion groups)" (1998, p.2). Knowlton argues that the role of student and teacher must change in online education since the traditional teacher/professor lecture aspect of class is removed in an online course where lectures are prepared and posted online in advance. Knowlton goes on to suggest that a traditional teacher-centered classroom reflects one-way communication while a student-centered online class

requires two-way communication through collaboration and dialogue among students and professors. As discussed later in this chapter, two-way communication is a key feature of online education.

The change in roles for both teacher and student in online education is reflective of the potential for online education to support constructivist pedagogy, where students collaborate in learning through engagement with authentic, problem-solving activities, in technology enhanced classrooms (Barron & Goldman, 1994). Relan and Gillani (1997) suggest that online education has the potential for supporting a constructivist and collaborative learning environment for the following reasons: (a) provides access to a variety of real-world information sources; (b) provides a variety of communication methods which support collaboration, discussion and exchange of ideas; (c) provides an international platform for the expression of a range of artistic and cognitive concepts; and (d) provides a medium that supports simulations, apprenticeships and partnerships (p. 43).

A similar perspective is shared by Dede (2000), Kearsley and Shneidermann (1999), Knowlton (2000), Spira (1998) and others. While these authors may differ in the terms they use to describe their pedagogical orientation, the basic tenants of the pedagogical approach are similar to those listed by Relan and Gillani. Each of these authors also agree that online education offers the potential for facilitating this constructivist approach to education. While the use of technology in and of itself does not guarantee a shift in the focus or method of teaching (Cuban, 1986), emerging distance education technologies can provide tools that support new ways of presenting information, communicating and teaching (Dede, 2000).

According to the most recent, reliable government statistics, online education is the fastest growing aspect of distance education. Between 1995 and 1998, the percentage of higher education institutions in the United States using two-way interactive video and one-way video remained approximately the same (between 48% and 57%) (Lewis et al., 1999). During the same time period, Internet-based online education grew from 22% in 1995 to 60% in 1998, outpacing the established video-based distance education technologies (Lewis et al.). Of the 1,680 institutions of higher education in the United States offering distance education courses in 1998, 87% indicated they offered asynchronous, Internet-based online courses as compared to 65% that offered two-way interactive video. When asked which distance education technologies the institutions planned to deploy over the next three years, 73% indicated asynchronous, Internet-based online courses; 62% indicated synchronous, Internet-based online courses and 52% indicated two-way interactive video (Lewis et al., p. 40).

Hanna (2000) and others (Arenson, 1998b; Murnane & Levy, 1997) suggest external pressures are supporting the growth of online programs in higher education. These pressures include: (a) the increasing cost of residential college and university tuition; (b) the growing demand for higher education and the value of a degree in the workplace; (c) the demand for work-related education; and (d) workplace requirements for collaborative, problem-solving and critical analysis skills.

It is important to note that the last item listed above reflects a fundamental change in the nature of work in the United States. Murnane and Levy document a shift in the United States from a manufacturing economy where unskilled labor could be trained to work on an assembly line to a knowledge economy, where skilled workers are

required to work together to solve real-world problems. This shift in the skill level required to participate in today's workplace coincides with the emerging sense, discussed above, that online education supports a collaborative, problem-solving approach to learning (Dede, 2000; Kearsley & Shneiderman, 1999; Knowlton, 2000; Relan & Gillani ,1997; Spira, 1998). These pressures, combined with changing student demographics, increased student demand and the emergence of online competitors, are facilitating the development and acceptance of online distance education programs on traditional facility-based colleges and universities across the country (Arenson, 1998a).

Characteristics of Online Education

Online education refers to a specific type of technology facilitated distance education. Online education occurs in a computer-mediated environment where the teacher and student are physically separated for some portion, if not all, of the instructional process (Turoff & Hiltz, 1995). In online courses, course content, such as lectures, demonstrations, resources and assignments, are typically presented to students using a course website. The course website may be designed by the instructor, by a team of course developers, or some combination of the two.

When faculty first began teaching courses online, the course website was often developed using Hyper Text Markup Language (HTML) and text editor software. This approach required the faculty member interested in developing an online course to learn HTML or to learn how to use a WYSIWIG software editor such as Netscape Composer or FrontPage. More recently, learning management systems (LMS) such as Blackboard, WebCT and IntraLearn have been introduced. These LMS are used for both the

development of course materials and the management and conduct of online courses. While faculty using an LMS for course development may no longer need to learn HTML they still require training in the use of the LMS in order to develop and teach an online course.

Online courses may use a cohort model, where students move through the course material in a paced group (Motiwalla & Tello, 2000), or they may be self-paced, allowing individual students to start and complete courses at their own pace. Regardless of the pacing, students typically have access to course materials 24 hours per day from any Internet access point (Hiltz & Wellman, 1997). Students access the course website using web browser software over an Internet connection (Kearsley, 2000; Motiwalla & Tello, 2000). While this study examined online education in programs that are offered 100% online without requiring a face-to-face (FTF) component, it is important to acknowledge a third category, the hybrid course. The hybrid course typically meets in a FTF classroom for all or some portion of the course duration while enhancing the learning experience through the use of various online course components (Ko & Rossen, 2001). For an extensive sampling of online and hybrid courses, visit the World Lecture Hall online at http://www.utexas.edu/world/lecture.

The content in an online course can be presented in a number of ways. Table 1 compares the fundamental components of a face-to-face (FTF) course and an online course. These fundamental components are drawn from a number of sources, including Driscoll (1998), Harasim et. al. (1996), Kearsley (2000), Khan (1997), Ko and Rossen (2001) and Motiwalla and Tello (2000).

Table 1

FTF versus Typical Online Course Components

Course Element	FTF Course	Online Course
Course location	on-campus classroom	online website
Course materials	textbook	textbook, CD-ROM, online Links
Course lectures	instructor presentation	text notes, PowerPoint slides, digital streaming media
Questions, discussion	FTF discussion	threaded discussion, text chat, email videoconferencing
Assignment/projects	printed handouts, disk, documents	email attachments, posted web forms
Student assessment	In-class exams, projects and participation	Online exams, chat room/discussion postings, email/website projects

Course lectures may be presented as text, as PowerPoint presentations, or as streaming audio/video presentations. Course demonstrations or course labs may be presented using streaming audio/video or using graphic simulation software. Simulation software often allows students to manipulate variables in the simulation, affecting the outcome of the demonstration. Student assignments and projects may be returned to the instructor as email attachments, through online web forms, or as student PowerPoint presentations.

Communication, questions and discussion between students and faculty and among students are facilitated through the use of asynchronous (delayed) and synchronous (real time, simultaneous) communication tools (Collison et al., 2000; Kearsley, 2000; Motiwalla & Tello, 2000; Salmon, 2000). Asynchronous communication

tools include email and threaded discussion forums. These tools allow an instructor or student to post a question or comment, and then allow others to respond at a later point in time. Synchronous communication tools such as text-based chat, desktop videoconferencing, and audio conferencing, require students and instructor to be online at the same time and allow immediate response and feedback among participants. These are the communication tools that define interaction in online courses, a topic discussed in depth later in this chapter.

Benefits of Online Education

In 1987, Chickering and Gamson released *The Seven Principles for Good Practice in Undergraduate Education.* These seven principles were based on "50 years of research on the way teachers teach and students learn, how students work and play with one another, and how students and faculty talk to each other" (Chickering & Gamson, 1987, p. 3). The seven principles include:

1. Encourage contact between students and faculty;
2. Develop reciprocity and cooperation among students;
3. Encourage active learning;
4. Give prompt feedback;
5. Emphasize time on task;
6. Communicate high expectations;
7. Respect diverse talents and ways of learning.

Five of these principles emphasize communication and interaction between students and teachers and among students, reflective of the research discussed later in

this chapter regarding student-teacher interaction and the research referenced by Chickering and Gamson when developing the principles.

In 1996, Chickering and Ehrmann reviewed the seven principles in relationship to advances in educational technology. While not focusing on distance education specifically, Chickering and Ehrmanns' review of the seven principles suggests that technology, when appropriately applied, can enhance interaction, communication and feedback between students and faculty. Included among their technology-enhanced principles were:

1. Contact between students and faculty – online technology can support increased contact between students and faculty;

2. Reciprocity and cooperation among students – online technology can support increased opportunities for interaction and collaboration among student learning teams;

3. Use of prompt feedback – online technology can support various forms of prompt feedback between students and faculty;

4. Communication of high expectations – online technology can support communication and demonstration of high expectations, examples of exemplary work and communication tools for students and faculty.

These four principles emphasize the need for communication, feedback and interaction between students and faculty while Chickering and Ehrmann point out how online technology can facilitate these principles. In their review of the quality of research about distance education, Phipps and Merisotis (1999) discuss the seven principles and suggest that these principles apply equally to an education facilitated through distance education.

Moving beyond the principles of good practice, numerous authors have identified the potential benefits of online education. These benefits include:

1. Ability of students to remain physically separated from instructor and each other yet maintain communication (Rahm & Reed, 1997; Motiwalla & Tello, 2000, Turoff & Hiltz, 1995);

2. Ability for students and instructor to communicate anytime, anyplace (Harasim et al. 1996; Turoff & Hiltz, 1995);

3. Ability of students to access course materials anytime, anyplace (Khan, 1997);

4. Ability of instructor and students to integrate global online resources into the course website (Kearsley, 2000; Khan, 1997; Relan & Gillani, 1997);

5. Ability of instructor and students to construct a media rich learning environment (Kearsley, 2000; Wulf, 1996);

6. Ability to support collaboration between physically separate student groups (Reeves & Reeves, 1997).

The first three items on the above list highlight the potential for online education to increase student access to education by reducing geographic barriers and addressing time constraints. Thompson (1998) suggests that the ability to address both geographic and time constraints makes distance education especially suited to meet the needs of adult students, who often have multiple societal roles (student, parent, worker) which make conflicting demands on adult students (Cross, 1981; Pappas & Loring, 1985).

Item 4, the ability to integrate global online resources into a course website supports instructors' and students' ability to incorporate real-world activities and resources into the online classroom. This is particularly appropriate for adult students,

who are typically interested in the immediate application of the learning experience to their real-world lives (Cross, 1981; Knowles et al., 1998; Pappas & Loring, 1985).

Item 5, the ability to construct a media rich learning environment supports a multi-sensory approach to teaching and learning (Dede, 1995; Kearsley, 2000). A multi-sensory approach, offered online through the use of multimedia technology (text, graphics, audio, video) provides opportunities to meet the needs of students with different learning styles (James & Gardner, 1995; Sanchez & Gunawardena, 1998; Williams & Peters, 1997) and students with disabilities (Burgstahler, 2000).

Finally, Item 6, the ability to support collaboration between physically separate student groups through the use of asynchronous discussion, synchronous conferencing, web safaris, electronic whiteboards and other techniques increases opportunities for cooperative and collaborative learning (Bonk & Reynolds, 1997; Harasim et al. ,1996; Kearsley, 2000; Palloff & Pratt 1999). Anderson and Garrison (1998) suggest that networked, online technologies support a more collaborative approach to learning than prior approaches to distance education. A more collaborative approach to education may prove beneficial to all students who will find that today's workplace requires the ability to work cooperatively in teams to analyze and solve real-world problems (Hanna & Associates, 2000; Murnane & Levy, 1997).

Interaction

Instructional interaction between student and teacher and among students is a critical aspect of this research study. While this study examined instructional interaction in online education, a significant body of research exists documenting the importance of interaction in supporting positive learner outcomes among campus-based undergraduate students. Before discussing the unique characteristics of interaction in online education, this study will consider the findings of these campus-based studies and how they support the relationship between interaction and persistence in online education.

Relationship Between Interaction and Persistence

The importance of interaction between students and teacher in supporting positive learner outcomes among campus-based undergraduate students is well documented. Flanders (1970) conducted extensive studies regarding student-teacher interaction in the face-to-face classroom and concluded that increased interaction between student and teacher was positively correlated to gains in student achievement and positive attitudes towards learning. Pascarella and others (Pascarella & Chapman, 1983; Pascarella et al., 1983 ;Pascarella & Terenzini, 1976; Pascarella et al., 1978) have conducted an extensive examination of student-faculty interaction among undergraduate students attending campus-based colleges and universities. These studies distinguish between formal (academic) interaction that occurs within the classroom and informal (social) interaction that occurs outside the classroom. These studies have found that the frequency and content of formal and informal interaction between instructors and

undergraduate students are correlated to gains in student achievement (Kuh & Hu, 2001; Pascarella & Terenzini; Pascarella et al.), student persistence (Terenzini & Pascarella, 1978; Terenzini & Pascarella ,1980) and degree completion (Tinto, 1987).

Much of the literature on persistence and dropout draws it theoretical framework from the research conducted by Vincent Tinto. Tinto's model of college student dropout suggests that persistence, a student's commitment to completing a program of study at a particular institution, is an outcome of the student's academic and social integration into that institution's community (Tinto, 1987). Tinto proposes a longitudinal model where students enter an institution with varying personal, family and academic characteristics and commitment. Students' intentions and commitments are modified over time as they interact with the primary academic and social systems of the institution. Tinto presumes that satisfying encounters with these systems lead to greater academic and social integration, which leads to increased institutional, and goal commitment. Negative encounters reduce academic and social integration, distancing the student from the institution, reducing institutional and goal commitment and promoting dropout (Pascarella & Terenzini, 1991).

While Tinto's research was conducted primarily on undergraduate students in residential four-year colleges and universities, later researchers applied a similar theoretical framework to different on-campus groups of students. Pascarella and Chapman (1983) studied the application of Tinto's model to undergraduate commuter students and found that while academic integration (formal contact) maintained a strong causal influence on student persistence, social integration (informal contact) did not. Sweet (1986) applied Tinto's model to undergraduate students enrolled in print based

correspondence courses and found that telephone contact with program tutors was positively correlated to student persistence. Towles, Ellis and Spencer (1993) found that telephone contact with distant learners enrolled in video-based distance learning courses positively influenced persistence rates among freshman. These studies suggest that Tinto's model of college student dropout provides a framework for understanding the relationship between student-faculty interaction and student persistence in environments beyond those examined by Tinto himself.

Pascarella and others (Kuh & Hu, 2001; Pascarella & Terenzini, 1976; Pascarella et al., 1978; Woodside, Wong et al., 1999) replicated and refined Tinto's work and found that student-faculty interaction in formal and informal settings was positively correlated to student persistence. Drawing on Tinto's work, Pascarella proposes a general model for assessing change among students in a college environment that increases emphasis on an institution's structural/organizational characteristics and the role of student effort (Pascarella & Terenzini ,1991). Pascarella's model is comprised of five clusters of variables that have direct and indirect effects on student outcomes (Pascarella & Terenzini, 1991; Kuh & Hu). The first two clusters include student background characteristics and the institutional structure and organization. These two clusters influence each other and support a third cluster, student perception's of the institutional environment. As a group, these three clusters influence the "key agents of socialization" (Kuh & Hu, p. 314), faculty and peer interaction. Student characteristics, institutional environment and faculty and peer interactions affect a fourth cluster, the quality of student effort. The interaction between these clusters of variables has been found to

affect student outcomes such as achievement, persistence and satisfaction (Pascarella & Terenzini, 1991, Kuh & Hu).

Building on the research conducted by Pascarella and Terenzini, Kuh and Hu (2001) conducted an extensive study examining the impact of student-teacher interaction on student learning and development involving 5400 students at 126 institutions during the 1990's. Their study, based on Pascarella's model found:

1. As students progressed from freshman to senior year, the frequency of interaction with faculty increased along with a shift from social to academic or career-related interactions;

2. Substantive student-faculty interactions (i.e., academic or career related interactions) were positively correlated to student reported gains in intellectual development, general education, personal development and vocational preparation;

3. The positive effects of student-faculty interactions were mediated by the effort students expand on educationally purposeful activities.

The Kuh and Hu study did not examine persistence, however it did validate Pascarella's model across multiple institutions, confirm the important role of student-faculty interaction in supporting student outcomes, and remind the researchers that while important, student-faculty interaction is one aspect of a complex equation.

While this proposed research study is primarily interested in the relationship of instructional interaction and student persistence, it is important to understand that a range of factors contribute to a student's decision to persist in a program of study. Pascarella's model helps to situate student-faculty interaction within a complex web of variables affecting a student's decision to persist in a program of study.

Interaction in Distance Education

As discussed earlier in this chapter, the use of technology in facilitating distance education primarily addresses two characteristics: the delivery of educational content and communication between students and teacher (Holmberg, 1995; Keegan, 1986; Verduin & Clark, 1991). Holmberg states that the delivery of educational content, which he terms the presentation of learning material, is an independent, one-way process between student and content, while interaction between teachers and students constitutes a two-way communication process. While both the delivery of educational content and interaction between students and teacher are important to the learning process, this study focuses on the use of technology to facilitate the latter, interaction between student and teacher and among students.

While the terms interaction and interactivity are sometimes used interchangeably in the distance education literature (Anderson & Garrison, 1998; Smith & Dillon, 1999) a close review of the literature suggests that interactivity defines aspects of a delivery system while interaction defines a two-way communications process (Kearsley, 1995; Moore, 1989; Moore & Kearsley, 1995; Wagner, 1994). This distinction is important, is consistent with the previous discussion of student-faculty interaction in higher education and supports the focus of this research study on the communication process between student and teacher and among students.

Wagner provides a definition of interaction specifically meant to address the communication process that occurs when education is facilitated through technology. Interaction is broadly defined as “reciprocal events that require at least two objects and

two actions" (1994, 8). Wagner goes on to define an instructional interaction as an interaction that occurs between the learner and the learner's environment in an effort to shape the learner's behavior toward an educational outcome. The learner's environment may include the teacher, other learners and course content. Moore (1989) specifically identifies these three types of interaction in his discussion of interaction in distance education: learner-content, learner-instructor and learner-learner. Wagner's definition of interaction can be illustrated by examining one type of interaction. For example, in the case of learner-teacher interaction, the teacher is an object (Object 1) that presents information in some format (Action 1). The learner is an object (Object 2) that receives and processes the information (Action 2, 3, etc.). A similar interaction process can be described for learner-learner and learner-content interaction.

In addition to the different types of interaction identified by Moore, Kearsley suggests a distinction must be made between immediate (synchronous) interaction and delayed (asynchronous) interaction. This distinction regarding the method of interaction is important since it affects the provision of feedback to the learner, a concept that Garrison (1987), Holmberg (1995), Smith and Dillon (1999), and others, identify as critical to the learning process. Distance education technologies that support synchronous interaction can provide immediate feedback to learners, a feature that may serve to motivate some learners (Moore & Kearsley, 1995). Distance education technologies that support asynchronous interaction can provide the learner with more control over where and when the instructional interaction occurs as well as provide the learner with more time to reflect on and respond to course content and communications (Moore & Kearsley, 1995).

Mediated communication is a central characteristic of all distance education. Holmberg (1995) references the term mediated communication when discussing interaction between tutors and students in distance education. Holmberg uses the term tutor, rather than teacher or instructor. The use of tutor is reflective of Holmberg's experience with the European-style open university model of distance education. In this model, print-based course materials are prepared by a group of course developers or subject matter experts, delivered to students, then course communication occurs between the tutor, rather than a university instructor or faculty member.

Holmberg identifies two forms of interaction between tutors and students in distance education. Contiguous interaction refers to the face-to-face communication that occurs in a physical classroom. Non-contiguous interaction refers to communication that is conducted through a medium other than face-to-face conversation. Communication may be mediated through the written or printed word, by telephone, through audio or videotape, and most recently, through computer text and computer audio/video conference. Each of these technologies supports a different form of mediated communication.

Garrison argues that mediated communication is the "quintessential characteristic of distance education" (1987, p. 96). He suggests that different forms of mediated communication have different characteristics that support student learning, student satisfaction and student persistence to varying degrees. Garrison recommends studying specific characteristics of mediated communication, such as speed and frequency of tutor feedback, pacing of feedback, ability to support contact with other students, in order to establish the mediated communication method's ability to support the learning process.

Moore (1989) cautions against committing a distance education program to only one form of mediated communication, since different forms of mediated communication may support different types of interaction to varying degrees and in support of varying student learning styles.

Computer-mediated communication (CMC) is one form of mediated communication central to online education. CMC uses email and computer conferencing systems to facilitate communication between students and teachers and among students (Hiltz & Wellman, 1997; Kearsley, 2000). CMC provides students and teacher with a two-way communication method based on the electronic transmission of text (Erling Ljosa as cited in Holmberg, 1995). While the use of computers to facilitate email correspondence and computer conferencing was still relatively new in distance education, Holmberg noted the potential contribution of this tool in addressing "a great weakness of distance education …the slowness of the communication process" (1995, p. 122). Citing Ljosa, Holmberg notes that CMC offers the potential for expediting tutor response time; decreasing the time it takes students to receive feedback on assignments and course progress. In addition to decreasing the potential response time, CMC supports multiple forms of communication: (a) 1:1 communication through email, (b) 1: Many communication through the electronic bulletin board, (c) Many: Many communication through electronic meeting spaces (Erling Ljosa as cited in Holmberg, 1995, 44-45).

CMC in today's online education incorporates each of the elements described by Ljosa in 1995. In addition to asynchronous communication tools such as email and electronic bulletin boards, synchronous communications is supported through text-chat,

audio-chat, desktop video conferencing and emerging groupware applications (Collison, Elbaum et al., 2000; Dede, 1995; Kearsley, 2000; Salmon, 2000). This study proposes to examine online education in a program that supports both synchronous and asynchronous interaction through the use of email, electronic bulletin boards and text-based chat.

Summary

The preceding pages provide an in-depth examination of the literature as it relates to the conceptual framework for the proposed study. Since this study examined the relationship between instructional interaction and student persistence in online education, it is important to understand the characteristics of online education, the nature of interaction in online education, and the relationship of interaction to student achievement and persistence.

As discussed in the preceding pages, online education offers increased educational access to students constrained by geographic and time barriers (Romiszowski,1993; Thompson, 1998) while also offering the potential for a constructivist learning experience, where students learn collaboratively through engagement with authentic, problem-solving activities (Relan & Gillani, 1997). The opportunity to work on real-world tasks, develop problem-solving skills and collaboration skills is critically important to students and workers in our emerging knowledge society, where these skills are increasingly required to gain entry into the workforce (Barron & Goldman, 1994; Hanna & Associates, 2000; Murnane & Levy, 1997).

Online education is defined by the technology used to facilitate the delivery of course content and to facilitate interaction between student and teacher and among students. Computer mediated communication (CMC) is a central characteristic of online education (Hiltz & Wellman, 1997; Kearsley, 2000; Turoff & Hiltz, 1995). CMC, in its various technologies and forms, supports 1:1 communication, 1:Many communication and Many:Many communication in both a synchronous and asynchronous format (Erling Ljosa as cited in Holmberg 1995; Moore & Kearsley, 1995). These multiple communication methods support various methods of student access, various pedagogical approaches, and various forms of interaction with course content, the course instructor and fellow students.

The literature clearly indicates the importance of interaction between student and faculty in supporting student achievement and student persistence in traditional, undergraduate campus-based settings (Kuh & Hu, 2001; Pascarella & Terenzini, 1991). The Seven Principles of Good Practice in Undergraduate Education emphasize the importance of communication, interaction, collaboration and feedback in both campus-based (Chickering & Gamson, 1987) and technology facilitated courses (Chickering & Ehrmann, 1996). While only a few studies have been conducted which examine the relationship between interaction and student persistence in distance and online education settings, their findings suggest a relationship exists which warrants further examination (Garrison, 1987; Sweet, 1986; Towles et al., 1993).

Given the importance of interaction in supporting student achievement and student persistence, along with the growing popularity and potential of online education, this research study offers the potential to make a timely contribution to a better

understanding of the relationship between instructional interaction and student persistence in an online education. Chapter III introduces and explains the details of the research methodology, drawing on the conceptual framework described in this chapter.

CHAPTER III

METHODOLOGY

Introduction

This chapter describes the research design utilized in this study including the relationship of the research questions to the variables under examination and the procedures followed in the development and implementation of the study. A full description of the research setting, data analysis and limits regarding validity and reliability are also presented. The intent of this chapter is to provide the reader with sufficient detail to judge the appropriateness of the methodology, evaluate the research conclusions and to replicate the study in other distance education environments.

Purpose and Overview

A quantitative research study was conducted which examined the relationship between interaction and student persistence in online education. Specifically, this non-experimental, correlational study asked if a relationship exists between the frequency and method of interaction in online courses and student persistence in these courses. The researcher theorized that the frequency of instructional interaction and the method of instructional interaction (asynchronous or synchronous) in online courses were positively correlated to student persistence. This research study utilized a survey research

methodology and records review to investigate the relationship between instructional interaction and student persistence in online courses.

Research Questions

Four questions guided the conduct of research and analysis of data. These questions, and a brief description of their relationship to the research activities are listed below.

Question 1. Is there a relationship between the frequency of instructional interaction and levels of student persistence in online courses? As established in Chapter II, interaction between students and teachers is critical in supporting positive learner outcomes. The researcher collected data related to the frequency of instructional interaction in the online courses participating in the study, used this data to develop a course interaction index and then analyzed the relationship between the frequency of interaction and student persistence.

Question 2. Is there a relationship between the method of instructional interaction and student persistence in online courses? While previous researchers have established frequency and duration of feedback as critical in supporting positive learner outcomes, research regarding the relationship between method of instructional interaction in online courses and student persistence is very limited. The researcher collected frequency and duration of interaction data by method that allowed the creation of method of interaction indexes for each course. A correlational analysis was then conducted regarding the relationship between the method of interaction and persistence. The data also supported

the grouping of courses according to the primary method of interaction which facilitated an examination of differences between courses in regard to use of interaction methods.

Question 3. Do the reasons students provide for failure to persist in online courses differ based on the frequency or method of instructional interaction? Chapters I and II discuss the range of reasons students choose to participate in, or withdraw from, a course or program of study. The researcher collected data regarding why students withdraw from their online courses and why students intended to enroll, or not enroll, in future online courses. The researcher then compared the reasons students provided for withdrawing from their online course to the reasons students provided for enrolling, or not enrolling, in future online courses.

Question 4. Do other variables emerge as correlates of persistence among students in online courses? Online education is a relatively new phenomena and most research to date has focused on grade and student satisfaction comparisons between online and on-campus courses. While this research study was specifically interested in the relationship of instructional interaction to student persistence, it is quite possible that other correlates of persistence may emerge. Research activities related to this question examined student attitudes to interaction, student attitudes to their online course, student attitudes to the use of specific methods of interaction, and their relationship to persistence.

Participants

Research Setting

The online learning program that participated in this study is operated by the continuing education division of a publicly funded state university located in an urban community in New England. This continuing education division has offered a range of undergraduate certificate and degree programs to adult students in the traditional evening school format since the early 1970's. In response to the demands of students and regional employers, the division recently expanded its program and course offerings to include undergraduate and graduate certificate and degree programs in both online and off-campus face to face formats. The division enrolls approximately 20,000 students per year in a five semester, year round enrollment cycle.

The programs of study offered by the division represent the range of disciplines hosted by the university's academic colleges. These disciplines include education, engineering, management, computer and information science, liberal arts and humanities and health professions. The online program currently offers complete undergraduate certificate and degree programs in the areas of information technology, management and liberal arts. The program has recently expanded online graduate certificate and degree programs in the areas of education, engineering and health professions. The online program enrolled 4500 students in 200 course sections during the 2000 – 2001 academic year.

The online program uses a learning management system (LMS) for the development and teaching of online courses. The LMS allows faculty to develop course

materials (e.g., lectures, assignments, presentation slides, animations), which are then accessed by students online via a web browser. All faculty teaching in the online program participate in a training program that introduces online pedagogy and instructs faculty in how to use the LMS to develop and teach an online course. The majority of course materials are developed by faculty, with the assistance of division staff, prior to the first offering of the online course.

Course materials are released to students on the course website in a paced, weekly format. While students have access to course materials 24 hours per day, 7 days per week, (24/7) the courses are not self-paced. Students progress through the course materials and weekly lessons in a cohort group. An archive is maintained of all discussion forum and chat postings. Students can access these postings at any point subsequent to their release throughout the semester.

The LMS used by the program supports both asynchronous and synchronous communication methods. As outlined above, these methods include synchronous text-based chat, asynchronous text-based discussion forums and asynchronous email lists. Faculty receive training in how to use all three methods for communicating with students, and are encouraged to integrate both synchronous and asynchronous methods into the conduct of their course.

Sample

The population for this study included 1569 undergraduate and 51 graduate students enrolled in 76 online courses offered in the Fall 2001 semester by the continuing education division of a public university. The unit of analysis for this study was the individual, online course. Given the course as unit of analysis and the high number of courses required to conduct appropriate statistical measurements (e.g., minimum 60 courses for 2X3 factorial design, 40 courses for 2X2 factorial design), all online courses which met the criteria for selection were asked to participate in the study. Criteria for selection included:

1. The instructor agreed to allow presentation of survey tool to all students in the course.
2. The instructor agreed to allow researcher to review course communications.
3. The course met the enrollment-based survey submission rates described below.
4. The courses included all of the disciplines offered online by the program at the time of the study (Education, Humanities, Information Technology, Management, Mathematics, Sciences).

An email was sent to all instructors teaching online courses during the Fall 2001 semester explaining the purpose of the study, the role of the researcher, the reasons/method for selecting his or her class and a request for permission to survey his/her students at the end of the semester (Appendix A). Participation in the study was voluntary and the instructor reserved the right to withdraw consent prior to the end of the active semester.

Response Rates

Multi-tier Response Rates. Response rates were calculated separately for persisters, students who maintained enrollment in their online course through the 14 week semester, and non-persisters, students who administratively withdrew from their online course prior to the end of the semester. In regard to the response rate for persisters, the percentage of students completing the survey data for each course ultimately determined whether or not course data was included in the study. Since persister responses were collected individually and then grouped at the course level to calculate per course interaction and attitude indexes, it was important that a relatively high number of respondents per course submitted survey data. Generally, while email and web-based surveys provide benefits in terms of design and data collection options, they do not typically match postal mail response rates of 50% to 70%.

When discussing traditional mail surveys, Babbie (2001) suggests response rates within the following guidelines: 50% is an adequate response rate, 60% is a good response rate and 70% is a very good response rate (p. 256). While Babbie does not recommend a specific response rate for online or email surveys, Schaefer and Dillman (1998), in a study comparing mail survey and email survey response methods, found a mail survey response rate of 58% compared to an email response rate of 49%. Couper, Blair and Triplett (as cited in Dillman, 2000), in a survey conducted across five U. S. statistical agencies, found a postal mail response rate of 71% compared to agency average e-mail response rate of 43%. Schillewaert, Langerak & Duhamel (1998) report their response rates of 22% to 36% for a three round email survey compared positively to

email surveys conducted by Opperman (1995), Mehta and Sivas (1995), and Anderson and Gansneder (1995); who achieved email survey response rates of 24%, 40% and 68% respectively. The above observations are confirmed by literature that discusses the response rates of students enrolled in distance education courses, whether conducted online or via two-way or one-way television. Survey response rates of between 35% and 45% have been reported by Fredericksen, Pickett, Shea, Peltz and Swan, (1999) and Turoff and Hiltz, (2000).

In an effort to balance the rigorous response rate demands of quality survey research while acknowledging the literature that indicates email and web-based surveys often have lower response rates, this researcher established a multi-tier survey submission rate per course based on the number of students who were enrolled in each course at the end of the Fall 2001 semester. In order to be included in the study, courses with adjusted course enrollments (i.e., ACE = Total Enrollments minus Voluntary Dropout) at the end of the semester of 21 students or higher had to meet a 50% response rate to be included in the study. Courses with 10 to 20 students had to meet a 60% response rate while courses with less than 10 students had to meet an 80% response rate. The higher response rate for low enrollment courses assisted in ensuring that respondents adequately represented what occurred in their online course.

Persister Response Rates. A request to participate in the online student survey was distributed to the 1475 students who maintained enrollment in the 74 courses that agreed to participate in this study (Appendix B). These course offerings included five graduate courses and 69 undergraduate courses. Of the 74 courses participating in the study, 22 courses did not meet the response rate criteria. A total of 714 student online

surveys were returned for the 52 courses that met the participation criteria, representing an overall 64.0% response rate.

While a 64.0% overall response rate is considered a good response rate (Babbie 2001) the use of the course as the unit of analysis for many aspects of this study required the use of per course response rates as a criterion for inclusion in the study. As discussed above, a multi-tier per course response rate criterion, reflective of adjusted course enrollments, was established in order to mitigate the effects of individual survey responses in very low enrollment courses (i.e., less than 10 students). Table 2 lists the mean adjusted course enrollment and the mean response rate for each response rate criterion group.

Table 2

Mean Adjusted Course Enrollment and Response Rates for Three Response Rate Criteria Groups

	Adjusted Course Enrollment		Response Rate	
Criteria Group	M	SD	M	SD
50% Response Rate	25	3.30	.62	.09
60% Response Rate	16	4.07	.72	.11
80% Response Rate	7	1.41	.89	.08

Note: Adjusted Course Enrollment equals Total Enrollment minus Voluntary Dropout.

Of the 52 courses with adequate response rates, 36 courses met the 50% response rate criterion (i.e., ACE greater than 20 students), 12 courses met the 60% response rate criteria (i.e., ACE between 10 to 20 students) and 4 courses met the 80% response rate

criteria (i.e., ACE less than 10 students). Courses that met the response rate criteria closely reflected the distribution of disciplines in the overall online program and included four graduate and 48 undergraduate courses. Table 3 reports the representation of academic disciplines for this study.

Table 3

Distribution of Courses and Academic Disciplines Participating in Study

	Courses Participating in Study (n = 52)		Total Courses Online (n = 74)	
	n	%	n	%
Academic Discipline				
Education	3	5.8	3	4.1
Humanities	11	21.2	16	21.6
Information Technology	31	59.6	41	55.4
Management	2	3.8	4	5.4
Mathematics	2	3.8	3	4.1
Science	3	5.8	7	9.5

Non-persister Response Rate. Non-persisters were identified through a review of the course enrollment records. The non-persister group included 138 students who administratively withdrew from a course in the online program prior to the end of the 14-week Fall 2001 semester. Due to the time constraints involved in completing a telephone interview or paper survey, students who withdrew from multiple online courses were asked to complete only one interview or paper survey for one course. The selection of which courses these students would complete an interview or survey for was done on a random basis. The sample was reduced to 102 non-persisters after removing students who withdrew from multiple courses as well as 5 students with out of country or undeliverable mailing addresses.

The non-persister survey response rate was 45% with 10% of the eligible non-persisters declining to participate and another 45% who did not return a consent to participate form or a completed survey. While this low response rate limited the use of non-persister responses for statistical comparison to the students who completed their online course, it did assist in identifying reasons why non-persisters withdrew from their online courses as well as possible demographic and situational differences between students who persisted and those who did not. These data will be examined at greater length in Chapter IV.

Instrumentation

This study utilized a survey research methodology to collect data regarding instructional interaction in online courses, characteristics of students who persist and those who do not persist, and student attitudes to their online course experience. Since two groups of students were involved in the study, persisters and non-persisters, two separate surveys were developed and administered to the respective student groups. The construction of these two surveys is discussed below.

Persister Survey

The persister survey was developed to collect data regarding the online course experience of students who maintained enrollment in their online course through the 14 week semester. This 37 item survey, contained in Appendix B, collected data regarding: (a) student demographics and characteristics, (b) the frequency of interaction in each online course, (c) the method of interaction in each online course, (d) student intent to

return, (e) student attitudes toward interaction, (f)) student attitudes toward the courses, (g) the contribution of interaction methods to the students' course experience, and (h) technical access information. Table 4 details the relationship between the survey measurement objectives and the items in the persister survey. These will be discussed in more detail below.

Table 4

Persister Survey Measurement Objectives

Objectives	Corresponding Questions
1. student demographics/characteristics (age, sex, experience, program)	1 - 5,31 - 37
2. frequency of course interactions	14, 15
3. method of course interactions (synchronous, asynchronous) (chat, discussion, email)	16 - 19 21 - 24 26 - 29
4. student intent to return	3, 13, 13a
5. student attitudes toward interaction	7 - 10
6. student attitudes toward course experience	6, 11,12
7. contribution of interaction method	20, 25, 30
8. technical access	38

Non-persister Survey

The non-persister survey was developed to collect data regarding the online course experience of students who administratively withdrew from their online course

prior to the end of the 14 week semester. This 37 item survey, contained in Appendix D, collected data regarding: (a) student demographics and characteristics, (b) student reasons for enrolling in and withdrawing from their online course, (c) student attitudes toward their course, (d) student attitudes toward interaction, (e) student intent to return, (f) the frequency of interaction their online course, and (g) the method of interaction in each online course. Table 5 details the relationship between the survey measurement objectives and the items in the non-persister survey. These items and their relationship to the variables being examined in this study will be discussed in more detail below.

Table 5

Non-persister Survey Measurement Objectives

Objectives	Corresponding Items
a. student demographics/characteristics (age, sex, experience, program)	1 - 9, 31 - 36
b. reasons for enrolling, withdrawing	11, 12, 13
c. student attitudes toward course experience	14, 19, 20
d. student attitudes toward interaction	15 - 18
e. student intent to return	6, 21, 21a
f. frequency of course interactions	22, 23
g. method of course interactions (synchronous, asynchronous) (chat, discussion, email)	24 - 30

Independent Variable

The independent variable in this study is instructional interaction. For the purposes of this study, instructional interaction is defined as directed communication

regarding course content and topics between the instructor and students or among students in the online course program (Kearsley, 1995; Wagner, 1994).

This study examined two aspects of instructional interaction, the frequency of instructional interaction and the method of instructional interaction. Several useful characteristics for quantifying interaction in distance learning environments include the frequency, duration, immediacy and the method of interaction. Feedback, a related measure that reflects the response to an initial interaction, is considered a critical aspect of any distance learning system and the learning process (Main & Rilse, 1994; Smith & Dillon, 1999). It was beyond the scope of this research project to examine the ramifications of all aspects of interaction, so this project focused on the frequency and method of instructional interaction in the online course as well as student attitudes to interaction. The measures of frequency and method of instructional interaction discussed below assisted in developing a profile of the instructional interaction that occured in each course.

Frequency of Interaction. Frequency of instructional interaction refers to how often students and instructors, and students and students, interact regarding course related materials. Three measures were created to facilitate the analysis of frequency of instructional interaction: Frequency of Instructor Interaction, Frequency of Student Interaction, and the Interaction Index. Frequency of Instructor Interaction provided a per course measure of how frequently each instructor used all course communications methods to interact with the students in his or her course. Frequency of Student Interaction provided a per course measure of how frequently students used all course communications methods to interact with other students in their respective courses.

Instructor interaction and student interaction were each measured by one item on the persister survey. Respondents were asked to use a 5-point Likert Scale to report how often they used all course communications methods and how often their instructor used all course communications methods. The response values for these items ranged from never, less than once per week, about once per week, several times per week, and nearly every day. Individual student scores on each item were averaged to create a frequency of instructor interaction and a frequency of student interaction score for each course.

The Interaction Index was created as an overall measure of the frequency of interaction in each course. Individual student responses to the frequency of instructor to student interaction and frequency of student to student interaction items were added together to create a new student variable, SumQ14Q15. The student scores for SumQ14Q15 were then summed and averaged for each course, creating an overall frequency of instructional interaction index for each course.

Method of Interaction. The method of instructional interaction refers to whether the interaction within a course occurred asynchronously, using the discussion forum or email lists, or synchronously, using the online chat tool. Method of instructional interaction was measured through a series of items on the persister survey (see Table 4). For each of the three methods of interaction, a series of items asked students to report the frequency of instructor use, the frequency of student use and the duration of student use. Student responses to these items were used to create the following per course measures: (a) three Method of Interaction Indexes, which provided an interval level measurement of the overall interaction in each course by each method of interaction; (b) two Primary Method of Interaction measures, which provided a categorical measure of the primary

method of instructor interaction and the primary method of student interaction within each course.

An additional three items on the persister survey provided three Course Related Usage measures, which identified the percentage of students within each course that used each method of interaction to share course related materials. The creation of each of these measures is described below.

Students responded to each of the frequency of interaction by method items on a 5-point Likert Scale. The response values for these items ranged from never, less than once per week, about once per week, several times per week, and nearly every day. The three student duration items (Items 18, 23, 28; Appendix C) were reported by students on a 4-point Likert Scale. Response values ranged from less than 15 minutes, 16 to 30 minutes, 31 to 60 minutes and more than 60 minutes. These three items were part of a skip pattern in the persister survey. These items were recoded to a 5-point Likert Scale that included "never" as a response value.

A course mean was calculated for each of the frequency of interaction and duration of interaction by method items. Initial analysis suggested a high degree of correlation between the frequency of instructor interaction, frequency of student interaction and duration of student interaction items within each method. A Pearson Product Moment Correlation was conducted between the mean course values for each of these items. The results of this analysis is displayed in Table 6.

Table 6

Intercorrelation of Interaction Items by Method of Interaction

	Chat Method			Discussion Method			Email Method		
	Freq. of Instructor	Freq. of Student	Duration of Student	Freq. of Instructor	Freq. of Student	Duration of Student	Freq. of Instructor	Freq. of Student	Duration of Student
Chat Method									
Frequency of Instructor		.80***	.77***						
Frequency of Student	.80***		.94***						
Duration of Student	.77***	.94***							
Discussion Method									
Frequency of Instructor					.87***	.73***	.37**		.35*
Frequency of Student				.87***		.88***			
Duration of Student				.73***	.88***				
Email Method									
Frequency of Instructor				.37**				.41**	.59***
Frequency of Student							.41**		.72***
Duration of Student				.35*			.59***	.72***	

2-tailed significance, * p < .05, ** p < .01, *** p < .001

Correlations between the three chat items were significant at the $p < .01$ level as were the correlations between the three discussion items. Correlations between the three email items were significant at the $p < .05$ level. The positive correlation between the frequency of instructor interaction, frequency of student interaction and duration of interaction items within each method suggested the creation and use of a method of interaction index for each course.

Three method of interaction indexes were created for each student by summing student scores for the frequency of instructor interaction, the frequency of student interaction and the recoded duration of student interaction scores for each method of interaction. These new scores reflected the cumulative amount of interaction perceived by each survey respondent by method, within each course. These three new student scores were then grouped at the course level and three new indexes were created for each course: Chat Method Index, Discussion Method Index and Email Method Index.

Appendix E contains course scores for each method of interaction index. A reliability analysis conducted on the three items composing each of the method of interaction indexes suggested a high degree of reliability. Coefficient alphas of .92 for the Chat Method Index, .93 for the Discussion Method Index and .77 for the Email Method Index were obtained.

The Method of Interaction Indexes discussed above provided an interval level measure for use in correlational analysis with persistence. The researcher was also interested in examining whether or not combinations of interaction methods were related to persistence. To assist in this analysis, two categorical variables were created: Primary

Method of Instructor Interaction and Primary Method of Student Interaction. Primary Method of Instructor Interaction was coded by assigning a category to each course based on the course's dominant instructor method of interaction. The categories for this variable included Chat, Chat/Discussion, Discussion, Discussion/Email, Email, Email/Chat and All Methods Equally.

Each course was assigned to a category based on the course's highest median score on each of the instructor frequency of interaction by method variables (Items 16, 21, 26; Appendix C). Due to concerns regarding the distribution of course scores for these items, the researcher used the median, rather than the mean value to assign courses to levels of each variable. The median value is typically less effected than the mean in asymmetric distributions of data while in a normal distribution, the median will equal or approximate the mean (Shavelson, 1996; Zechmeister & Posavac, 2002). If a course had two equally high scores, it was assigned to either the Chat/Discussion or Discussion/Email category (no courses scores qualified for the Email/Chat category). If all three scores were equal, the course was assigned to the All Methods Equal category.

The Primary Method of Student Interaction was created in a similar manner, except that courses were assigned to a category based on the median course score for each of three frequency of student interaction by method items (Items 17, 22, 27, Appendix C). The categories used for this variable included Chat, Chat/Discussion, Discussion, Email and All Methods Equally.

Three additional items on the persister survey asked students whether they used each method to share course related materials with their classmates (Items 19, 24, 29). The purpose of these Course Related Usage items was to identify whether students were

using each method of interaction for course related purposes or non-course related purposes. Each item was phrased in a similar manner, “Did you use online (method) to share course related resources and materials with your classmates?”. Respondents were asked to respond yes or no. Only students who previously indicated they used a specific method of interaction were asked to complete these items.

Student responses were used to create a level of course related usage for each course for each method of interaction. The researcher reviewed the percentage distribution of responses per course for each item and then coded each course according to the percentage of respondents who indicated they shared, or did not share, course related materials via each method of interaction. If more than 50% of the respondents per course skipped or missed this item, the course was coded as low response and was not included in further analysis of these items. Courses were coded according to the percentage of students who indicated they shared course related materials using a specific method of interaction.

Dependent Variable

Student persistence, a dependent variable, addresses a student’s commitment to complete a course and program of study. Persistence is considered a positive outcome measure but is often quantified through the measurement of its negative equivalent outcome, dropout. Both persistence and dropout can be measured by an examination of course enrollment records at various points in the semester (e.g., start of semester, add/drop deadline, after grades are submitted). A persistence rate was constructed for each course by subtracting the number of students who administratively withdrew from a

course (voluntary dropout) along with students who failed or took an incomplete in the course (involuntary dropout) from the total enrolled in the course at the end of the two week Add/Drop period (total enrollment). The resulting difference was then divided by the total enrollment, creating the course persistence rate. The per course persistence rate provided a useful measure of what percentage of students completed each online course.

Persistence among adult students was also measured through the student's intention to continue his or her program of study. This was measured by asking students first if this was their final course in their program of study and then asking if they intended to return the following semester to take another online course. A measure of intent to return was included in this study of persistence among adult online students.

An important aspect of research on persistence and dropout is contact with those students who withdraw from a course of program of study. A frequent criticism of the online and distance learning research conducted to date is that too often these studies do not include the perspective of students who withdraw from the course or program under study (Phipps & Merisotis, 1999; Turoff & Hiltz, 2000). For this reason an effort was made to contact and survey students who administratively withdrew from the online courses selected to participate in this study. This group of students is referred to as non-persisters throughout this study. The purpose of this contact was to a) collect data regarding the non-persisters' reasons for dropping out and b) to collect student characteristic data that will support comparisons between students who persist and those who do not. Students who maintained enrollment in their online course through the final grade period (i.e., did not administratively withdraw from their course) are referred to as persisters, regardless of their final grade or status after the fall semester ended.

Intervening Variables

As detailed in Chapters I and II, the literature identifies a range of factors shown to impact an adult student's decision to maintain enrollment in a course or program of study. Situational barriers reflect the demands of adult family, work and community life. Dispositional barriers reflect the adult learner's prior learning experiences, self-perceptions and attitudes as a learner. Institutional barriers reflect administrative, organizational and education practice within a particular institution. While the proposed research study focuses on one aspect of institutional factors, instructional interaction, it is important that the design of the study remain open to the contribution or effect of other variables.

This study used several methods for identifying the impact or emergence of these intervening variables. Situational barriers were examined through demographic and situational items on both the persister and non-persister survey (see Tables 4, 5). Age, gender, employment status, family size and similar characteristics were examined for persisters and non-persisters. Items 11, 12 and 13 on the non-persister survey (Appendix D) asked students to select from literature-based reasons, discussed in Chapter II, for continuing and/or withdrawing from their online course. The inclusion of several open-ended questions allowed both student persisters and non-persisters an opportunity to clearly express their perspectives regarding contributing and inhibiting factors in their online course experience.

Dispositional barriers were examined through an analysis of student attitudes. Two attitude scales were created that reflected student attitudes to each online course and

student attitudes to interaction within each online course. Three items on the persister survey (Items 6, 11, 12) asked students if: (a) the course contributed to their knowledge regarding the subject matter, (b) the course met the student's expectations, and (c) the student would recommend the course to another student. Students responded to each of these items on a 4-point Likert scale with the following values: strongly disagree, disagree, agree and strongly agree. A reliability analysis conducted with these three items resulted in a coefficient alpha of .89, with item to total correlations between .56 to .92, suggesting a high degree of reliability and the creation of an attitude to course index. Student responses to these three items were summed at the course level and a mean attitude to course value was calculated for each course. Appendix F contains descriptive statistics for this index along with a histogram plotting the distribution of per course scores.

Four items on the persister survey examined students' attitudes to interaction within each online course. Items 7 – 10 on the persister survey asked students about: (a) the timeliness of instructor feedback, (b) the utility of instructor feedback, (c) the appropriateness of the amount of instructor communication, and (d) the appropriateness of the amount of classmate communication. Each of these items explored additional dimensions of interaction, previously identified in Chapter II as important to any study examining interaction in distance learning environments. Student responses were recorded on a 4-point Likert scale, indicating whether they strongly agreed, agreed, disagreed or strongly disagreed, to a statement regarding each of these items. A reliability analysis conducted with these four items resulted in a coefficient alpha of .91, with item to total correlations ranging from .55 to . 86, suggesting a high degree of

reliability. Student responses to these items were summed at the course level and a mean student attitude to interaction value was calculated for each course. Appendix F contains descriptive statistics for this index along with a histogram plotting the distribution of per course scores.

Three items on the persister survey examined student attitudes toward the use of each method of interaction. These Course Contribution by Method items (Items 20, 25 and 30; Appendix C) examined the strength of student agreement with the following statement, "Overall, would you say (method) contributed to your online learning experience?". Students were asked to select a response from a 4-point Likert scale with the following values: strongly disagree, disagree, agree and strongly agree. Items 17, 22 and 27 served as a filter for each of the items 20, 25 and 30. If students indicated they never used a particular method in Items 17, 22 and 27, they were instructed to skip items 20, 25 and 30. Student responses for the three contribution items (i.e., 20, 25, 30) were grouped at the course level and descriptive statistics were calculated. An initial review of the distribution of per course responses for each item approximated a normal distribution, supporting the use of these items for correlational analysis.

Data Collection Methodology

This study utilized a multi-phased survey research approach to collecting data regarding instructional interaction and persistence among students and faculty in online courses. The three phases of this research study are described in Figure 2.

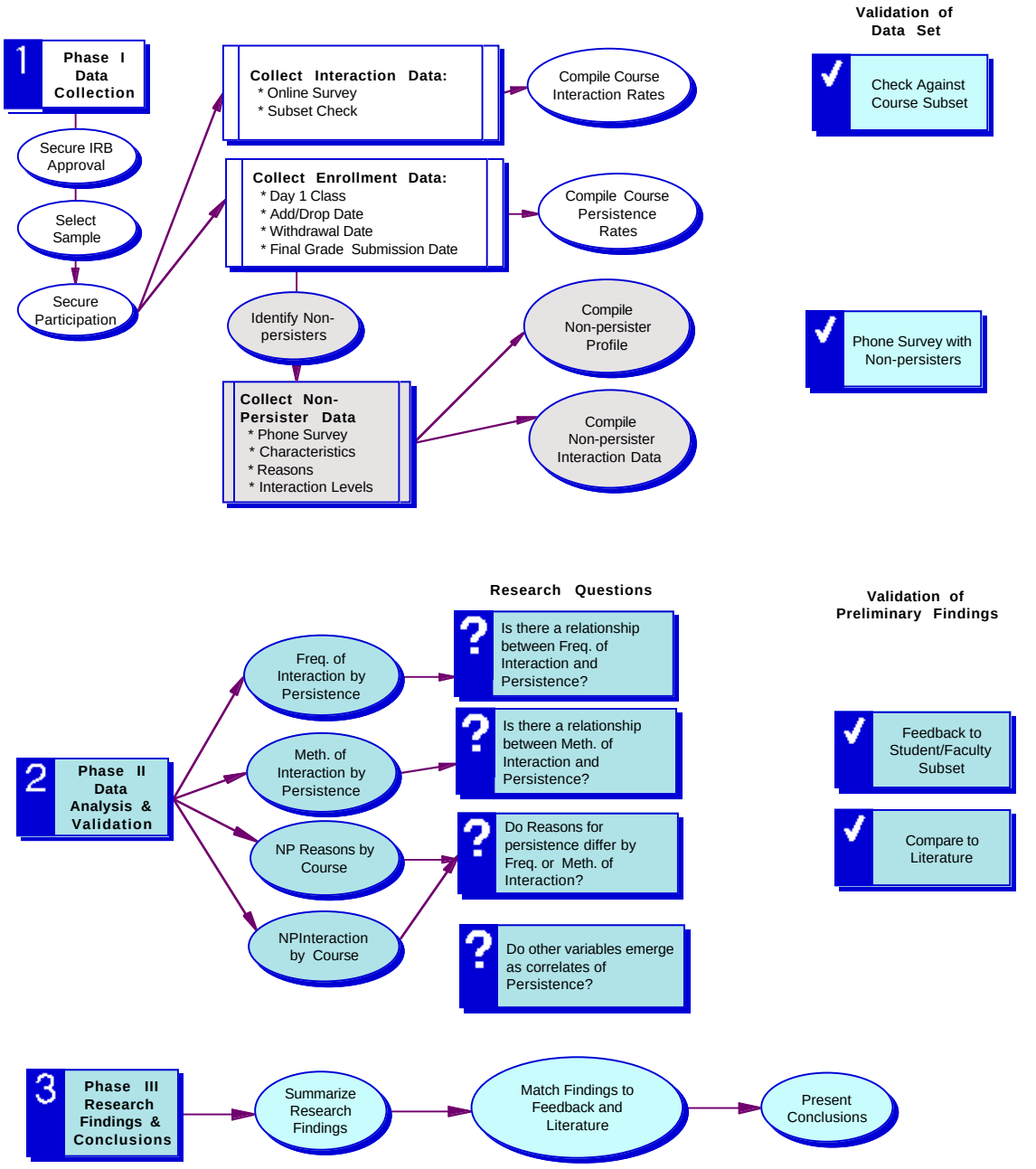


Figure 2. Three Phases of Research Study.

The first phase of the study focused on data collection activities. Data collection activities included: (a) Collection of interaction data, (b) collection of enrollment data,

(c) collection of non-persister data, (d) compilation of datasets, and (e) validation of datasets.

Interaction Data

Interaction data was collected from persisters through the administration of an online student survey accessed through course websites during the last three weeks of the Fall 2001 semester (Appendix C). The persister survey was created on a password protected website which students accessed when they logged into their online course. Students could only submit one survey for each course they were enrolled in during the Fall 2001 semester. Data was directly entered into an Access database where it was cleaned and prepared for analysis in SPSS V. 10**.**

Student participation in the persister survey was strictly voluntary. As an incentive for completing the persister survey, the code number for each student who submitted a survey was entered into a drawing for one of ten $25 gift certificates to Barnes & Noble. This incentive was announced in the original email sent to all students explaining the purpose of the study, the role of the researcher, the reasons/method for selecting the student's class and instructions for completing the survey (Appendix B). Students were also reminded of the $25 gift certificate incentive in each of the two subsequent reminder email messages sent to students to encourage submission of the surveys (Appendix B).

Enrollment Data

Student persistence was measured by examining and recording the enrollment rosters for participating courses at the end of the two week Add/Drop period and at the end of the fall semester. The examination of course enrollment rosters provided the following data: (a) the number of students who maintained enrollment in their online course; (b) the number of students who administratively withdrew from their online course, referred to as voluntary dropout; and (c) the number of students who failed or took an incomplete for a course, referred to as involuntary dropout. A persistence rate was constructed in the manner described above under the Dependent Variable section.

A second measure of persistence among adult students is the student's intention to continue his or her program of study. This was measured by three items on both the persister survey (Appendix C) discussed above and the non-persister survey (Appendix D) discussed below. Students were first asked if they had additional courses to take in their program of study and were then asked if they intended to take these additional courses online in the subsequent semester. A follow-up question asked both persisters and non-persisters to indicate why they intended, or did not intend, to take an additional online course in the subsequent semester.

Non-persister Data

As discussed above, an important aspect of any study on persistence is follow-up contact with students who drop out of the course or program of study. The purpose of this contact was to collect data regarding the students' reasons for dropping out and to collect student characteristic data that will support comparisons between students who

persist and those who do not. These students, referred to as non-persisters, were identified through a review of the enrollment and grade rosters.

For the purposes of this study, only students who administratively withdrew from their online course were labeled non-persisters. Students who did not administratively withdraw from their online course were labeled persisters, whether they received a passing grade, failing grade or incomplete. The reason for this was that the online student survey was administered during the last three weeks of the semester. Students who received a failing grade or incomplete still had access to the online course during this three week period and may have submitted an online survey regarding the course they were enrolled in, but had not yet failed or taken an incomplete. In order to ensure that online students were only a member of one research category (i.e., persister or non-persister) and that they were only interviewed once, students in the involuntary dropout group were treated as part of the persister group for purposes of survey research activity.

A non-persister survey was developed that included items similar to the demographic, interaction, and attitude items contained in the online student survey, but also solicited the students' reasons for dropping out of their online courses (Appendix D). The researcher originally planned to conduct a structured telephone interview using the non-persister survey with each consenting non-persister. An initial letter was sent to all non-persisters in January 2002 explaining the purpose of the research and the voluntary and anonymous nature of their participation (Appendix G). A $2.00 dollar cash incentive was included in each envelope, along with a consent to participate in a telephone interview form which non-persisters were asked to return to the researcher.

Initial comments from non-persisters who declined to be interviewed over the telephone suggested that they would be willing to complete and return a paper copy of the non-persister survey. Two subsequent reminder mailings to non-persisters included both the consent to participate in a telephone interview form along with a paper copy of the non-persister survey (Appendix G). Data collection for the non-persister survey occurred between January 2002 and March 2002. A trained research assistant conducted all telephone interviews and entered all paper survey data.

Data Analysis

In order to examine the four research questions discussed earlier in this chapter, data analysis was structured in a manner that mapped each set of variables to appropriate levels of measurement and the corresponding statistical tests. Table 7 maps each research question to research study variables, levels of measurement and appropriate statistical tests. The collection of interval data for frequency of interaction items and persistence rate allowed the calculation of mean interaction and mean persistence values for courses participating in this study. Measures of central tendency and measures of dispersion were calculated and included in the data review to assist in the establishment of a normal distribution.

Table 7
Research Questions, Study Variables and Analysis

Research Question	Study Variable	Level of Measurement	Analysis
1. Is there a relationship between Frequency of Instructional Interaction and Student Persistence?	Freq. Instructor (to Student) Interaction	Interval	Mean, Median,
	Freq. Student (to Student) Interaction	Interval	Standard Deviation
	Interaction Index	Interval	t-test
	Persistence Rate	Interval	Pearson *r*
2. Is there a relationship between Method of Instructional Interaction and Persistence?	Method of Interaction Indexes	Interval	Mean, Median,
	Persistence Rate by Course	Interval	Standard Deviation
			t-test
			Pearson *r*
	Primary Instructor Method	Nominal	Frequencies
	Primary Student Method	Nominal	Percentages
			ANOVA
3. Do reasons for Non-persistence differ by Frequency and Method of Interaction?	Non-persister Reasons	Nominal	Frequencies
	Persister Reasons	Nominal	Percentages
	Primary Instructor Method	Nominal	Crosstabs
	Primary Student Method	Nominal	Chi Square
			Qualitative Analysis
4. Do other variables emerge as correlates of Persistence?	Attitude to Interaction	Interval	Mean, Median,
	Attitude to Course	Interval	Standard Deviation
	Contribution by Method	Interval	t-test
	Persistence Rate by Course	Interval	Pearson *r*
	Course Related Usage	Nominal	Frequencies
			Percentages
			ANOVA

The primary statistical method of evaluating relationships between interval level variables was the Pearson Product Moment Correlation (Pearson *r*). The primary statistical method of evaluating differences between interval level variables was the t-test. Variations in the distribution and level of measurement for some independent variables required data reduction techniques that grouped courses according to median rather than mean values. These variations and data reduction techniques were discussed earlier in this chapter.

ANOVA was used to evaluate differences between interval level variables based on nominal level categories. Cross tabulations were used to evaluate the frequency and distribution of nominal level data. Chi Square analysis was used to assist in identifying differences between nominal categories.

Open-ended questions

While much of the data collected on both the non-persister and persister surveys consisted of interval and nominal level data, several open-ended questions on each survey allowed respondents to provide answers other than selections provided by the researcher. The researcher used a content analysis and scorer agreement approach to ensure a high degree of reliability when reporting this qualitative data (McMillan, 1997).

This approach required the researcher and research assistant to independently review open-ended responses to first identify common themes. After agreeing upon common themes, the researcher and research assistant developed a list of codes representing these themes. The researcher and research assistant then independently coded the open-ended responses using this list of themes. After this first coding, the

researcher and research assistant reviewed the results of their respective coding and reviewed the appropriateness of the list of codes. Modifications were made based on this review, then researcher and research assistant independently recoded each response. At this point, the inter-observer agreement rate was calculated by dividing the number of responses the coders agreed upon by the total number of responses. Inter-observer agreement for the reasons persisters provided for taking another online course was 96% while inter-observer agreement for the reasons persisters provided for not taking another online course was 98%.

Reliability

In order to ensure the reproducibility of research design and findings, it is important to review the reliability of the research tools and measures used in the conduct of research. Prior to developing the persister and non-persister survey instruments, the researcher reviewed the literature for pre-existing instruments that could be used for this study. Among instruments reviewed were the Flashlight Online Student Inventory (FOSI) (Ehrmann & Zuniga, 1992) and the College Student Experiences Questionnaire (CSEQ) (Pace, 1990). While these tools have been tested for both content-validity and internal reliability, they did not adequately address the variables examined in this study.

The CSEQ was developed for administration to on-campus undergraduate students and the questions on this questionnaire reflected this. Questions regarding interaction with faculty and peers were broadly stated to reflect face-to-face discussion between faculty and students and did not address specific aspects of interaction such as how often faculty and students interacted. The CSEQ had a very limited focus on

computer and information technology, which did not meet the needs of a study of online education. The FOSI did have a selection of items related to student use of technology in relationship to achievement, interaction with faculty and classmates and satisfaction with technology use, however the FOSI items reviewed by the researcher did not provide the level of detail required for this study.

In an effort to assure an adequate level of reliability, the following steps were undertaken. First, the survey was developed under the close supervision of a highly respected survey research faculty member and a team of advance stage graduate students who closely reviewed each item for appropriate wording, consistent meaning and standardized response; items identified by Fowler (1993) as critical properties of reliable survey questions.

A pretest administration of the survey was conducted with 106 students. A summary of the pretest administration is included in Appendix H. The researcher examined responses to identify missed items, clarity of response and consistency of response across courses. Changes were made to improve the placement of Yes/No response and course selection items. Several interaction questions were revised to clearly focus responses on the multiple dimensions of the independent and dependent variables. Finally, a question was added to identify students' intentions to enroll in future online courses.

The researcher examined the internal reliability of each of the previously discussed interval level indexes by conducting a reliability analysis in SPSS 10. Coefficient alphas for these indexes ranged from a high of . 93 for the Discussion Method Index to a low of .77 for the Chat Method Index. All fell within an acceptable

range of reliability (McMillan & Schumacher, 1997). Discussion of each measure's reliability is presented within the respective Instrumentation section above.

Validity

Pre-experimental designs present several threats to internal validity. The lack of random assignment of treatment groups is a threat to internal validity; however, this is not uncommon in educational research. In fact, the ethics of educational research inhibits the ability to randomly assign students to specific courses with specific instructors. In this study the researcher attempted to include all cases that met the course research criteria within the study. This was the case for both the persister and non-persister surveys. It is possible that students interested in or supportive of distance education will tend to enroll in online courses more than those who are not supportive, possibly skewing responses on the student survey.

A second threat to internal validity is the fact there was no control group against which to measure the results of research. However this study examined the phenomena within an online course environment and did not attempt to compare results across environments, hence the lack of a control group should not pose a significant threat to internal validity.

A third threat to internal validity is the nature of one-shot case study designs. In this type of design, a treatment is administered to one group and then a measure is taken. In this study, the group included students in the online courses participating in the study. After the students completed the treatment, a measure was taken, and then the researcher analyzed the results. The researcher attempted to address the impact of variables outside

the study through the collection of additional demographic data. Again, the study attempted to identify the relationship among variables and did not attempt to prove causation.

In order to assure that the student reported frequency of instructional interaction and method of instructional interaction measures accurately reflected what occurred in the online course, the dataset was validated against the course interaction archives in 10 (20%) of the courses selected to participate in the study. The student reported interaction data in all four courses with low enrollments (i.e., less than 10 students) was compared against the course chat and discussion interaction archives for these courses. Five other courses representing the 50% and 60% response rate groups were randomly selected for review and comparison of the student reported interaction data. In all cases but one, the researcher confirmed that the student reported chat and discussion interaction data reflected the frequency and method of interaction archive. In one low enrollment course (N = 7), the chat and discussion archive were not available for review. This course did, however, have a 100% survey response rate so the perceptions of all students enrolled in the course were reflected in the survey data.

This study did not use random sampling, which would improve the ability of the researcher to generalize the findings to a larger group. This study did attempt to explain the phenomena of persistence at one institution and does not necessarily describe phenomena at other online institutions. The study of persistence at one institution is supported by Tinto's theory of college dropout, which attempts to explain dropout at the intra-institution level, examining factors within an institutional environment that either contribute to, or prevent, dropout (Tinto, 1987).

The courses selected to participate in the study represented a broad range of academic majors, however not all majors were included. This limit regarding the disciplines currently online at this particular institution impedes the ability to generalize results to other disciplines. In any case, this research does not attempt to explain persistence at the discipline level.

The researcher identified and examined the impact of various demographic characteristics in order to control for their impact on the research results. This was also done in an effort to identify factors beyond the independent variables that may be related to student persistence.

Researcher's Role and Confidentiality

A note regarding the researcher's role at the institution under study is appropriate. At the time of this study, the researcher was Associate Director of Distance Learning for the program selected to participate in the study. In this role, the researcher oversaw the semester-based course evaluation and enrollment review processes for all courses in the online program. This evaluation activity had been ongoing since 1997 and proceeded as part of the division's administrative responsibilities regardless of the status of this research project.

This research project complemented ongoing evaluation activities by focusing on specific elements of online education (i.e., instructional interaction, dropout, student characteristics). In order to avoid conflict or the appearance of conflict, the researcher and the Dean of the division assured instructors in writing that participation in the study was strictly voluntary and a decision to participate or not participate would not affect the

instructor's teaching responsibilities or course assignments. Furthermore, student survey data and enrollment data were collected anonymously from students and did not include any course or instructor identification information. Since data were collected and coded anonymously it was not possible to use any data collected during this research project for administrative hiring or course scheduling decisions.

Student contact information (name, email address, phone number, mailing address, course address) was needed to a) contact students in courses selected to participate in the study in order to solicit their completion of the survey, b) to send follow-up requests to students who did not complete the survey following the initial request and c) to identify and contact a sample of students who dropped out of their online course. The student contact information was only used to facilitate initial contact with students and to identify whether or not a student had submitted a survey. This contact information was not associated with actual student responses.

Actual survey response data, whether submitted via the online student survey or during the non-persister telephone interview or paper survey, did not include any student identification information beyond a coded course number. Students accessed the online survey through the use of a unique student username and password. When students logged into their online course during the survey period (i.e., the last two weeks of the Fall 2001 semester), they were automatically presented with the links to the online survey for each course they were enrolled in (Appendix C). Through the use of a database setting, students were only allowed to submit one survey per course. Once students submitted an online survey, they were no longer presented with a survey link for that course. The telephone interviews were conducted by a research assistant trained in

telephone interview techniques. The research assistant entered responses into a password protected online database. No student or course identification information, beyond the coded course number, was submitted during the telephone interviews.

This research study was reviewed and approved by the University's Institutional Review Board (IRB) prior to the commencement of data collection activities. The IRB required the collection of written consent to participate in a telephone interview prior to telephoning and interviewing non-persisters in this study. The researcher agreed to abide by the guidelines established by the IRB.

Summary

This chapter described the research design and methodology, along with a discussion of strategies for addressing issues of reliability and validity. The online survey instrument, the telephone interview and mail survey instrument, a pretest survey and supporting materials were also introduced. The researcher's prior experience with the pretest instrument, as well as the reliability analysis and validity check conducted as part of this study, suggests that the instruments used adequately measured the phenomenon of interaction in online education. The measurement of persistence was conducted through a review of an institution's enrollment records. This chapter also outlined the statistical analysis utilized to examine each of the four research questions, as well as describing any challenges or changes required during the data collection period.

CHAPTER IV

ANALYSIS OF THE DATA

Introduction

This chapter reports the statistical analysis of the data collected as part of this research study. This discussion is organized around the four research questions guiding this study:

Question 1. Is there a relationship between the frequency of instructional interaction and levels of student persistence in online courses?

Question 2**.** Is there a relationship between the method of instructional interaction and levels of student persistence in online courses?

Question 3**.** Do the reasons students provide for failure to persist in online courses differ based on the frequency or method of instructional interaction?

Question 4. Do other variables emerge as correlates of persistence among students in online courses?

This chapter begins with a discussion of the demographic and situational characteristics of the sample. Descriptive statistics, including frequencies, means and standard deviations, are presented to depict the distribution of values for both independent and dependent variables. Measures of association, including correlational analysis, are presented to depict the strength of relationships between independent and

dependent variables. Inferential statistics, including t-tests and analysis of variance, are presented to establish the relationship between the sample and population as well as test the significance of differences among course levels of instructional interaction.

The data analysis which follows is based on the survey research and records review methods described in Chapter III. These methods included an online survey of students who persisted in their online courses, telephone interviews and mail surveys with students who withdrew from their online courses and enrollment records review. An online student survey was used to collect demographic and situational data regarding students who persisted in their online course as well as collect interval data regarding the frequency and method of instructional interaction within each online course. This student survey data was aggregated at the course level in order to establish course frequency and method of interaction levels. Telephone interviews and mail surveys, completed by students who withdrew from their online courses, were used to collect demographic and situational data and to identify reasons for non-persistence. This data allowed a comparison of persister and non-persister characteristics, experiences and perspectives. Enrollment records were used to identify non-persisters and to calculate per course persistence rates.

Persistence Rate

Enrollment records were available for all 74 courses that participated in the online student survey. Total enrollments were established for each course at the end of the initial two-week Add/Drop period. Withdrawal data were collected at the end of the ten-week withdrawal period, and confirmed again after grades were submitted at the end of the 14-week semester. These data were used to calculate course persistence rates, as discussed in Chapter III, for all courses in the sample. The collection of enrollment data for all 74 courses allowed the comparison of persistence rates, included in Table 8, between the 52 courses meeting the response rate criterion and the 22 courses that did not meet the response rate criterion. A review of Table 8 indicates the persistence rate is comparable between the qualifying sample and the non-qualifying courses.

Table 8

Persistence Rates for Population, Qualifying Sample and Non-Qualifying Courses

	Persistence Rate		
Criteria Group	M	SD	n
Population (Fall 2001)	.79	.11	74
Qualifying Sample	.80	.11	52
Non-qualifying Courses	.76	.12	22

In an effort to address concerns that persistence rates during the Fall 2001 semester might be adversely affected by the economic and political climate following the September 11th terrorist attacks, the researcher compiled persistence data for the online program for the preceding academic year. This period included the Fall 2000, Spring

2001 and Summer 2001 semesters. This data, included in Table 9, indicates that the Fall 2001 mean persistence rate of .79 (SD=.11) was consistent with the previous academic year's mean persistence rate of .79 (SD =.14). The data suggests that persistence rates were not adversely affected by the events of September 11th.

Table 9

Persistence Rates for Previous Academic Year and Semesters

	Persistence Rate		
Criteria Group	M	SD	n
Academic Year 2001	.79	.14	209
Fall 2000	.76	.15	60
Spring 2001	.80	.12	74
Summer 2001	.80	.16	75

Demographic and Situational Characteristics

Demographic and situational characteristics of the sample are reported below in Table 10 as a group rather than at the course level. Persister data was collected during the online student survey from students who maintained enrollment in their online course through the end of the semester. Comparable demographic data are also included for non-persisters who participated in the telephone survey or who completed and returned a mail survey.

Table 10

Demographic and Situational Characteristics of Respondents

	Persisters		Non-Persisters	
Characteristics	n	%	n	%
Total Sample	714		46	
Age at time of survey (years)				
18-24	105	14.9	9	20.5
25-34	239	33.9	13	29.5
35-44	234	33.2	11	25.0
45-54	111	15.8	9	20.5
55 or older	15	2.1	2	4.5
Gender				
Male	369	52.8	21	45.7
Female	330	47.2	25	54.3
Primary adult role				
Student	60	8.5	3	6.8
Parent	141	20.1	7	15.9
Working Professional	443	63.1	29	65.9
Other	58	8.3	5	11.4
Hours worked per week for pay				
0 hours	71	10.1	3	6.8
1-10 hours	14	2.0	--	--
11-20 hours	19	2.7	2	4.5
21-30 hours	44	6.3	1	2.3
31-40 hours	188	26.7	9	20.5
More than 40 hours	367	52.2	29	65.9
Children under 18 at home				
Yes	317	45.2	17	37.8
No	384	54.8	28	62.2
Years of Internet Usage				
Less than 1 Year	5	0.7	--	--
1-3 Years	65	9.2	1	2.2
More than 3 Years	633	90.0	44	97.8

Approximately one-third of persisters (33.9%) and non-persisters (29.5%) belonged to the 25 to 34 year old age range. There were slightly more male persisters (52.8%) than female persisters (47.2%). This compares to slightly more female non-persisters (54.3%) than male non-persisters (45.7%). Persisters (63.1%) and non-persisters (65.9%) identified their primary adult role as Working Professional. Consistent with this self-identification as Working Professional, a majority of persisters (52.2%) and non-persisters (65.9%) indicated they worked more than 40 hours per week. A similar percentage of persisters (54.8%) and non-persisters (62.2%) indicated they did not have children under the age of 18 living at home. Virtually all persisters (90%) and non-persisters (97.8%) indicated they had more than three years of experience using the Internet.

Table 11 below contains distribution data regarding student enrollment in certificate and degree programs. A large majority of persisters were enrolled in a degree or certificate program (72%) compared to slightly more than half of the non-persisters (56.5%). Of the persisters enrolled in a program, 58.2% intended to complete the program completely online while 40% of non-persisters indicated they intended to complete the program completely online. One item on each survey asked if students would complete their program in the current semester or would need to take additional courses. The majority of persisters (92.1%) indicated they needed to take additional courses in upcoming semesters, as did all non-persisters.

Table 11

Distribution of Respondents in Programs

	Persisters		Non-Persisters	
Characteristics	n	%	n	%
Total Sample	714		46	
Enrolled in degree or certificate program				
Yes	514	72.0	26	56.5
No	200	28.0	20	43.5
Total Respondents	714		46	
Completing this program entirely online				
Yes	298	58.2	10	40.0
No	214	41.8	15	60.0
Total Respondents	512		23	
Complete program this semester				
Yes	40	7.9	--	--
No	469	92.1	26	100.0
Total Respondents	512		26	
Intend to take another online course next semester				
Yes	405	86.4	15	57.7
No	64	13.6	11	42.3
Total Respondents	469		26	

Of the persisters who required another course in their program of study, 86.4% indicated they intended to take another online course during the upcoming semester. This compares to slightly more than half of non-persisters (57.7%) who indicated they intended to take another online course during the upcoming semester. A follow-up question asked both persisters and non-persisters to discuss why they intended or did not intend to take another online course. These data are discussed at length in response to Research Question Three below.

Table 12 contains distribution of course loads for both persisters and non-persisters. A comparable percentage of persisters (40.1%) and non-persisters (43.5%) indicated taking one course per semester.

Table 12

Distribution of Course Load

	Persisters		Non-Persisters	
	n	%	n	%
Total Sample	714		46	
Total courses taken per semester				
1	284	40.1	20	43.5
2	236	33.3	16	34.8
3	115	16.2	6	13.0
4	46	6.5	2	4.3
5	28	4.0	2	4.3
Hours per Week Engaged in Coursework				
Less than 3 hours	70	10.0	16	36.3
3-6 hours	274	39.0	14	31.8
7-9 hours	190	27.1	11	25.0
More than 9 hours	168	23.9	3	6.8

A comparable percentage of persisters (66.1%) and non-persisters (56.8%) reported spending three to nine hours per week engaged in course work, however, a larger percentage of persisters (23.9%) than non-persisters (6.8%) indicated spending more than nine hours per week engaged in coursework. This compares to a larger number of non-persisters (36.3%) than persisters (10%) spending less than three hours per week engaged in course work. Reasons for this difference will be discussed further under Research Question Three.

This review of the demographic and situational characteristics of both respondents who persisted and those who did not persist in their online course suggests that in many respects, these two groups are quite similar. Both groups are distributed similarly in respect to age, although the non-persisters had a slightly larger percentage of respondents in the 45 year or older range. Respondents in both the persister and non-persister groups selected similar primary adult roles. There were slightly more women in the non-persister group than in the persister group, but the representation of men and women in both groups was within plus or minus four percentage points of 50%. Slightly more persisters than non-persisters reported children living at home, while a significant majority of both persisters and non-persisters reported having used the Internet for more than 3 years.

While both persisters and non-persisters reported similar demographic and situational data in many respects, a few differences did emerge. A larger percentage of non-persisters than persisters reported working more than 40 hours per week, although when one collapses the 31 to 40 hour range with the more than 40 hour range, the percentage difference between persisters and non-persisters closes to approximately 8 points. A larger percentage of persisters report being enrolled in a certificate or degree program (about 15% larger) and a larger percentage of persisters indicate that they intend to take another online course in the next semester (86.4% persister to 57.7% non-persister). It is possible that some of the differences that emerged between persisters and non-persisters in regards to these characteristics are related to their respective decision to persist or withdraw from their online course. These questions will be addressed in more detail in the discussion of Research Questions Three and Four below.

Research Question 1: Is there a relationship between the frequency of instructional interaction and levels of student persistence in online courses?

For this research question interval data were collected to establish the frequency of instructional interaction and the level of student persistence for each online course. The following per course measures, described in detail in Chapter III, were created to facilitate the analyses described below: Frequency of Instructor Interaction, Frequency of Student Interaction, Interaction Index and the Persistence Rate.

Frequency of Interaction

Frequency of Instructor Interaction and Frequency of Student Interaction measures were created and examined in order to: (a) establish the frequency of instructor to student interaction in each course, (b) establish the frequency of student to student interaction in each course, (c) examine differences between the frequency of instructor to student and student to student interaction, and (d) examine the relationship between instructor to student and student to student interaction. Figures 3 and 4 below describe the distribution of per course scores for each of these frequency of interaction measures. Per course Frequency of Instructor Interaction scores ranged from 2.12 to 4.00, with a mean score of 3.10 (SD = .41). Per course Frequency of Student Interaction scores ranged from 1.25 to 3.86, with a mean score of 2.59 (SD = .54).

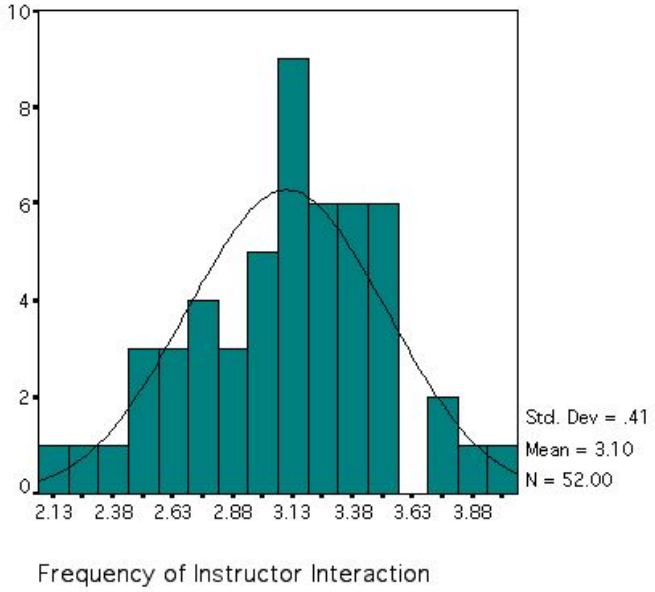


Figure 3. Distribution of Instructor to Student Interaction Scores by Course.

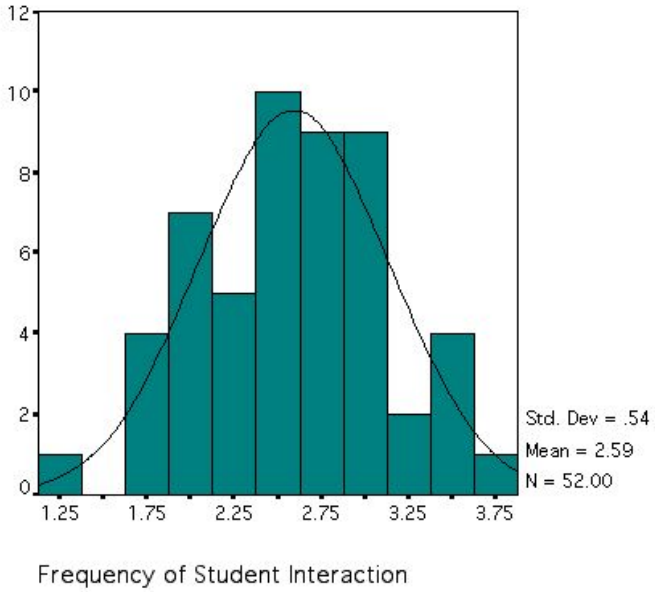


Figure 4. Distribution of Student to Student Interaction Scores by Course.

The difference in means for these two frequency measures suggested the need to examine the data more closely. A paired samples t-test was conducted using the mean

Frequency of Instructor Interaction scores and the mean Frequency of Student Interaction scores for each course. The results of this t-test indicated that per course Frequency of Instructor Interaction scores were significantly greater than per course Frequency of Student Interaction scores, t (51) = 9.125, p=.000, with a mean difference of 0.51. This finding indicates that overall, instructors used the online communications tools to interact with students more frequently than students used these tools to communicate with other students within each course.

In addition to the results of this t-test, a scatterplot examining the relationship between the frequency of instructor to student and student to student interaction suggests a strong, linear relationship between the two measures (see Figure 5).

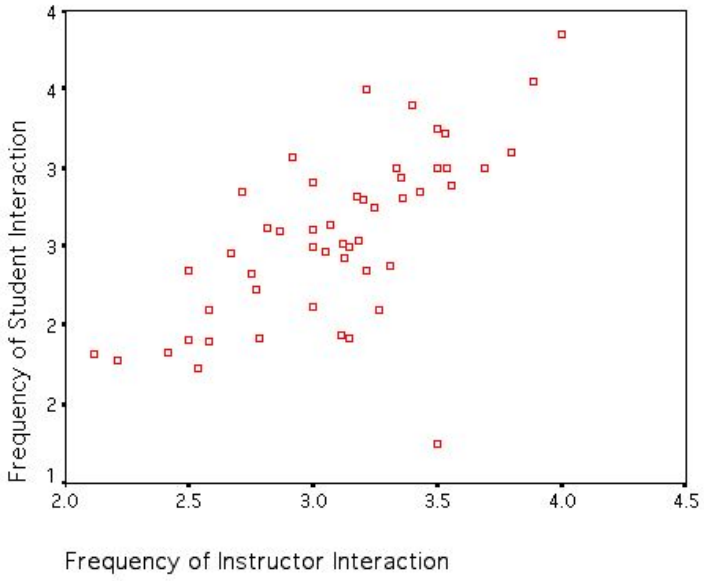


Figure 5. Per Course Frequency of Instructor to Student Interaction by Frequency of Student to Student Interaction Scatterplot.

After reviewing this scatterplot, a Pearson Product Moment Correlation was conducted between the course scores for Frequency of Instructor Interaction and

Frequency of Student Interaction. The correlation between frequency of instructor to student and student to student interaction was significant, $r_{50} = .68$, $p < .001$. The strength of this correlation suggests that as the frequency of instructor to student interaction increases in a course, the frequency of student to student interaction also increases. The relationship between these two variables also validates the use of the Interaction Index as a measure of the overall instructional interaction occurring within each course in this study.

Interaction Index

As described in Chapter III, the Interaction Index was created to reflect the overall frequency of instructional interaction in each online course. The Interaction Index is based on the Frequency of Instructor Interaction and Frequency of Student Interaction scores discussed above. Figure 6 below describes the distribution of per course scores for the Interaction Index. The sample mean Interaction Index score was 2.83 (SD = .44). Per course Interaction Index scores ranged from a low of 1.97 to a high of 3.93.

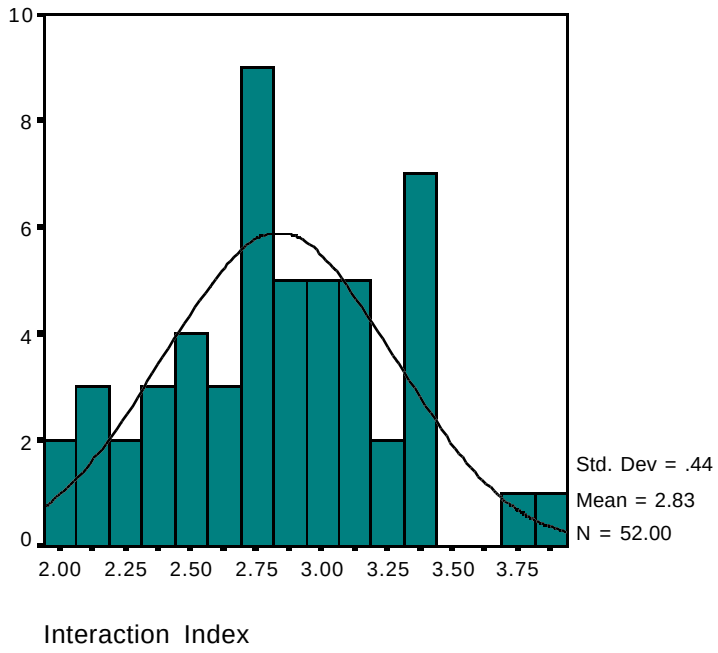


Figure 6. Distribution of Interaction Index Scores by Course.

Persistence Scores

In order to address this first research question the researcher developed a measure of student persistence. As discussed above, a course persistence rate was calculated for each course. The 52 courses which met the response rate criterion for this study had a mean persistence rate of .80 (SD = .11), meaning 80% of the students enrolled in online courses selected to participate in this study completed the course with a passing grade. Persistence rates among courses ranged from a low of 42% to a high of 100%. While a mean level of persistence of 80% may be desired by the online program director or a college administrator, the distribution of data for this dependent variable is negatively skewed, as shown in Figure 7. The extent of this skew could limit the utility of this measure in the application of parametric statistical analysis.

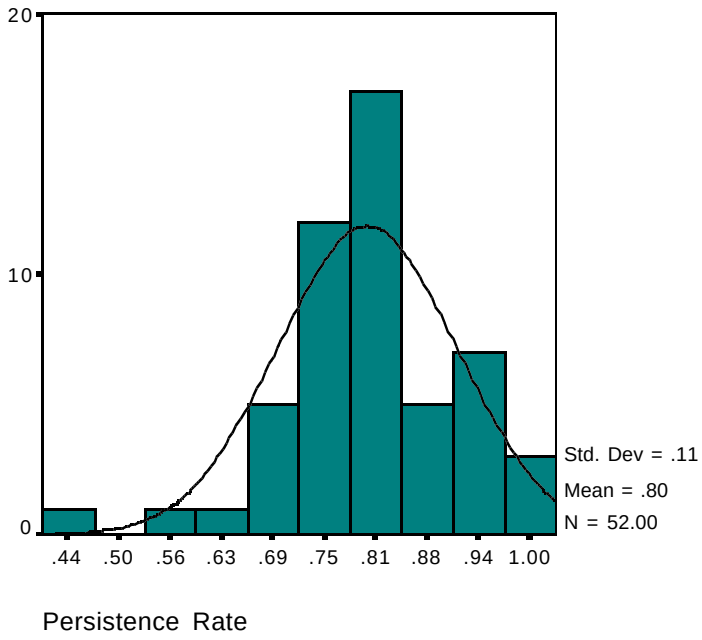


Figure 7. Distribution of Course Persistence Rates

According to Zechmeister and Posavac (2002), negatively skewed data can sometimes be adjusted to better represent a normal distribution by first reflecting the negatively skewed scores and then performing a nonlinear transformation. The raw persistence rate scores were first reflected using the following formula:

Reflected Score = (Highest Persistence Rate Score – Course Rate Score) + 1 (Zechmeister & Posavac, 3-20).

Reflecting the persistence rate score transformed the data to a positively skewed distribution, which could then be transformed by computing the square root of each value or by computing the logarithm of each value. Either of these methods will retain the order of values in the data but may change the relative magnitude of data points.

The values of the reflected persistence rate were recoded by taking the square root of each value. The resulting distribution, Figure 8, more closely approximates a

normal distribution than that found in Figure 7, permitting the use of parametric statistical analysis. It is important to keep in mind, however, that values along the X-axis have been inverted. Low values now represent courses with high persistence rates and high values now represent courses with low persistence rates.

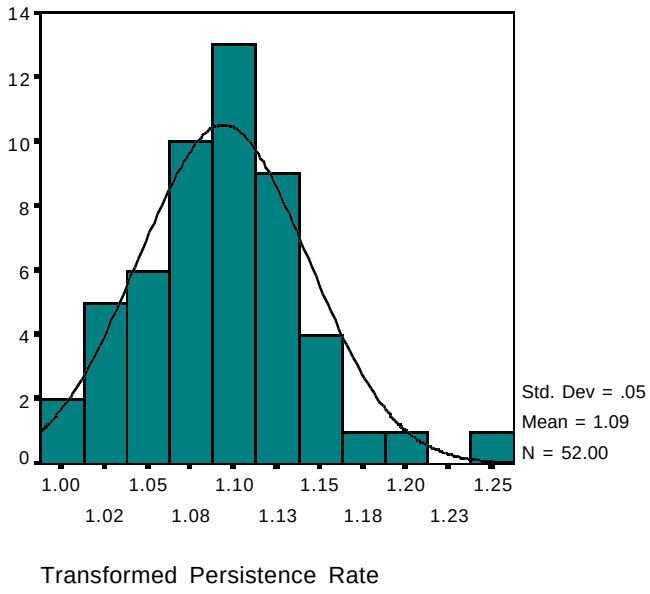


Figure 8. Transformed Persistence Rates

Correlational Analysis

Having first defined the variables appropriate to this research question and then having established the distribution of data for each variable, the next step in this analysis was to examine any possible linear relationship between each of the frequency of interaction variables, the Interaction Index, and the Transformed Persistence Rate. A series of scatterplots were conducted between the variables listed in Table 13 to discern any possible linear relationship. The Interaction Index by Transformed Persistence Rate

scatterplot is listed below in Figure 9 for reference in the discussion that follows. The remaining two scatterplots are contained in Appendix H.

Table 13

Intercorrelations of Three Interaction Variables and Persistence Scores

Variable 1	Variable 2	Observation
Frequency of Instructor Interaction	Transformed Persistence Rate	None Observed
Frequency of Student Interaction	Transformed Persistence Rate	None Observed
Interaction Index	Transformed Persistence Rate	None Observed

Note: A separate analysis, conducted with the Raw Persistence data and each interaction variable, confirmed these findings.

A review of the three scatterplots did not indicate a linear relationship between the Transformed Persistence Rate and any of the three interaction variables. A close review of the scatterplots did, however, indicate three cases with extreme persistence scores on all of the three scatterplots. This finding suggested the need for a closer review of these three cases.

Figure 9. Interaction Index by Transformed Persistence Rate Scatterplot

The same three extreme cases were identified on each scatterplot, courses 759, 786 and 802. Table 14 contains the Persistence Rate, Interaction Index score, the Frequency of Instructor Interaction score and the Frequency of Student Interaction score for each of these courses and for the sample.

Table 14

Persistence and Three Interaction Scores for Three Extreme Cases

	Persistence Rate	Interaction Index		Freq. of Instructor Int.		Freq. of Student Int.	
		M	SE	M	SE	M	SE
Sample Mean	.80	2.83	.06	3.10	.06	2.59	.08
Extreme Persistence Courses							
Case 759	.60	3.36	.18	3.21	.21	3.50	.23
Case 786	.42	2.79	.21	2.71	.18	2.86	.26
Case 802	.54	2.86	.18	3.07	.20	2.64	.23

A comparison of course interaction scores to the sample mean suggests that course 759 reported a slightly greater student frequency and interaction index than the sample while course 786 reported slightly less instructor frequency of interaction than the sample. However, a review of the scatterplots indicates that numerous other courses, with comparable frequency of interaction means do not exhibit such extremely low persistence rates. This would suggest that the frequency of interaction in these three courses is not related to the extreme persistence scores.

Summary of Research Question 1

Research Question One asked if there is "a relationship between the frequency of instructional interaction and levels of student persistence in online courses." The research activities described above suggest that there is not a linear relationship between frequency of instructional interaction and student persistence. While a linear relationship was not identified between persistence and interaction, this researcher did identify a strong positive correlation between the frequency of instructor to student interaction and the frequency of student to student interaction within the online courses participating in this study. This positive correlation between frequency of instructor to student and student to student interaction suggests the use of an Interaction Index measure, based on these two variables, is a valid measure of the overall frequency of instructional interaction in an online course.

This researcher did identify significant differences between how frequently instructors interacted with students and how frequently students interacted with other students within each online course. This research indicates that overall, instructors tend

to use the online course communication tools to interact with the students in their courses more frequently than their students interact with each other.

Research Question 2. Is there a relationship between the method of instructional interaction and levels of student persistence in online courses?

Method of Interaction

For this research question, interval data were obtained on the frequency and duration of instructor and student interaction with each of the three methods of interaction supported within each online course. Each of these three methods, synchronous chat, asynchronous discussion forum and asynchronous email lists, supports varying levels of feedback to students. As discussed in Chapter II, synchronous chat provides immediate feedback, while the asynchronous discussion forum and email lists provide delayed feedback to students. This research question required the examination of the relationship between these three methods of interaction and student persistence.

The researcher utilized both a correlational and categorical analysis of the data in order to address the research question. The following measures, discussed in Chapter III, were created to facilitate the analyses: three per course interval level indexes and two categorical measures. The three per course interval level indexes, which were used in the correlational analysis, include: Chat Method Index, Discussion Method Index and Email Method Index. The two categorical measures include the Primary Method of Instructor Interaction and the Primary Method of Student Interaction. The Transformed Persistence Rate measure discussed in the previous research question was also used in each analysis.

Correlational Analysis

Correlational analysis between the method of instructional interaction and persistence required the creation of three method of interaction indexes. These three indexes; the Chat Method Index, Discussion Method Index, and Email Method Index; reflected the overall interaction on the part of instructors and students within each method of interaction per course. Interval data were collected from persisters regarding the frequency of instructor interaction, frequency of student interaction and duration of student interaction by method. As discussed in Chapter III, these three items were highly correlated within each method of interaction. A reliability analysis of the three items composing each index revealed coefficient alphas of .92 for the Chat Method Index, . 93 for the Discussion Method Index and .77 for the Email Method Index. These data were then summed for each persister and a course mean calculated for each of the three methods of interaction. The Method of Interaction Index scores for each course are listed in Appendix E.

Once the three Method of Interaction Indexes were calculated, the distribution of course scores and descriptive statistics were reviewed for each index. Table 15 contains the mean and standard deviation for each of the three indexes.

Table 15

Means and Standard Deviations for Three Method of Interaction Indexes

Index	M	SD
Chat Method Index	8.08	1.66
Discussion Method Index	9.00	2.00
Email Method Index	6.97	1.02

A review of the histograms created for each of the indexes identifies some differences in the distribution of course scores (see Appendix I). The Chat Method Index indicates a negative skew, with the mode (8.75) clustered above the mean (8.08) and the median (8.53). Attempts to transform these scores in a manner similar to the persistence rate transformation discussed in Research Question One were not successful so the data were recorded as presented. The Discussion Method Index and Email Method Index reflected a better distribution, although the Email Method Index histogram suggests two patterns of overall usage, one clustered around the mean (6.87) and one clustered around the 25th percentile (5.96). The differences in distribution of method of interaction index scores is not surprising, since these scores reflect differences between courses in how the instructors and students use each method of interaction.

While the distribution of course scores for each of the method of interaction variables did not consistently reflect a normal distribution, the data did provide sufficient distribution to support further analysis. In order to address this research question, the researcher conducted a series of scatterplots between the transformed persistence rate and each method of interaction index (see Appendix J). While a review of these scatterplots did not indicate a linear relationship between persistence and any of the three method of interaction indexes, the existences of several extreme cases on each scatterplot suggested the need for further investigation. These three scatterplots for Persistence by Chat Method Index, Persistence by Discussion Method Index and Persistence by Email Method Index will be discussed below. The Persistence by Chat Method Index scatterplot, displayed in Figure 10, will be discussed first.

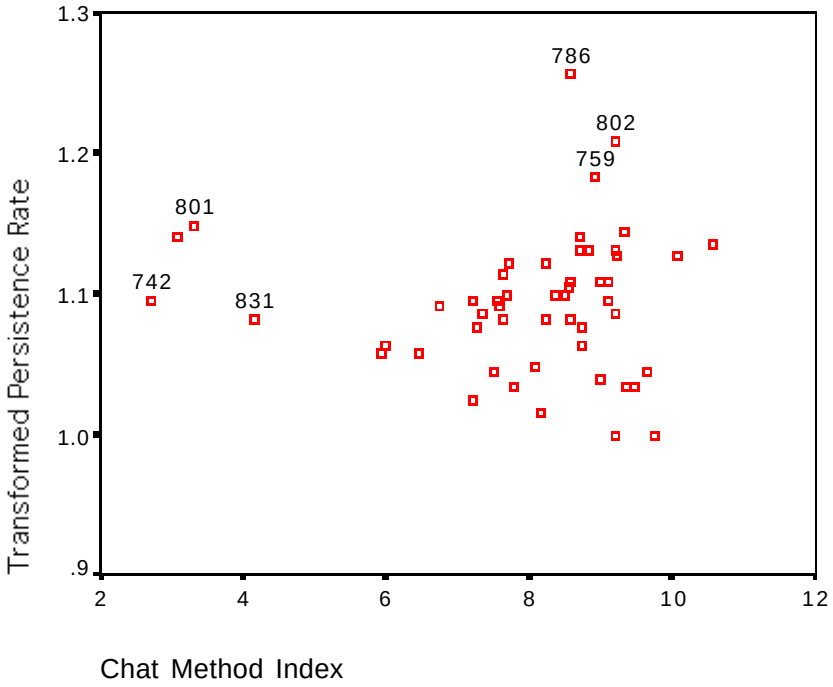


Figure 10. Persistence by Chat Method Index Scatterplot

While the Chat Method Index scatterplot did not display a linear relationship, an initial review of the scatterplot suggested a possible nonlinear relationship. Two groups of cases, distinct from the cluster of cases grouped between 6 and 10 on the axis and 1.0 and 1.15 on the abscissa, appear to form the tails of a curve. Cases 759, 786 and 802 represent cases with the lowest persistence rates in the sample, while cases 742, 801 and 831 depict cases with the lowest Chat Method Index scores. Although cases 759, 786 and 802 are extreme in regards to persistence, their mean Chat Method Index values, listed in Table 16, did not vary greatly from the sample mean of 8.00. This suggests their low persistence scores are not related to their chat index scores. While cases 742, 801 and 831 represent courses with the lowest Chat Method Index scores, their persistence rates range from .68 to .83, suggesting that their low chat index scores are not related to

their persistence rates. Given this analysis, it would appear that although these six cases represent extremes in regard to persistence (759, 786, 802) and chat index scores (742, 801, 831) their respective extreme scores are not related to each other.

Table 16

Persistence and Index Values for Extreme Cases

	Persistence Rate	Chat Method Index	Discussion Method Index	Email Method Index
Sample Mean	.79	8.08	9.00	6.87
Extreme Persistence				
Case 759	.60	8.93	10.93	6.07
Case 786	.42	8.57	5.14	5.57
Case 802	.54	9.21	9.07	7.14
Extreme Chat Score				
Case 742	.80	2.71	13.29	5.86
Case 801	.68	3.32	8.37	6.95
Case 831	.83	4.17	7.58	6.83

The same three extreme persistence cases (759, 786, 802) appeared in the Persistence by Discussion Method Index scatterplot and the Persistence by Email Method Index scatterplot (see Appendix J). A similar review of each of these scatterplots suggested that although these three cases represented extreme persistence rates, their discussion and email index scores represented even greater variation than their Chat Method Index scores. This supports the earlier statement that while these three cases represent courses with low persistence rates, it does not appear that these persistence rates are related to method of interaction.

Differences in Method of Interaction

Although the examination of scatterplots comparing persistence with each of the method of interaction indexes did not identify a linear relationship between these variables, the review of the distribution of course scores for each method of interaction index did suggest there were differences in how instructors and students used each method of interaction. In an effort to better understand these differences, the researcher examined two of the items that compose the method of interaction indexes: frequency of instructor interaction by method and frequency of student interaction by method. The researcher conducted three paired samples t-tests comparing the per course frequency of instructor interaction scores for each method to the per course frequency of student interaction scores for each method. The results of these t-tests are listed in Table 17.

Table 17

T-Test Results for Frequency of Interaction Scores by Method of Interaction

	Instructor Interaction		Student Interaction			
N=52	M	SD	M	SD	df	t
Frequency of Chat Interaction	2.80	.54	2.22	.47	51	12.77***
Frequency of Discussion Interaction	3.03	.69	2.95	.71	51	1.44
Frequency of Email Interaction	2.82	.50	1.85	.30	51	15.16***

2-tailed significance *p<.05, **p<.01, ***p<.001

The results of these t-tests indicate that the frequency of instructor interaction with chat was significantly greater than the frequency of student interaction with chat (p<.001). A similar significant difference occurs between the frequency of instructor interaction with email and the frequency of student interaction with email (p <.001). A

review of the mean instructor interaction scores and the mean student interaction scores for each course indicates that instructors use chat and email more frequently than the students enrolled in their courses. This finding is consistent with the finding in Research Question One that overall, instructors interact more frequently than the students enrolled in their course.

Categorical Analysis

The apparent lack of a linear relationship between persistence and each of the three method of interaction indexes, consistent with the findings of Research Question One, and problems with the distribution of the method of interaction indexes, suggests the need to more closely examine the method of interaction variables on a categorical, rather than a correlational basis. The first step in conducting a categorical analysis of the data was to determine which variables would be selected for analysis.

The previous discussion in Chapter III regarding the development of the method of interaction indexes found that frequency of instructor interaction and frequency of student interaction were positively correlated by each method of interaction. A separate analysis also determined that there was a difference in how frequently instructors and students used both the chat and email methods of interaction. These findings suggest that a categorical analysis should be conducted separately for instructor interaction and student interaction. Also, a review of the histograms presenting the distribution of scores for each of the method of interaction indexes suggests that instructors and students use a combination of methods when interacting in online courses. This observation suggests

that any variable developed for this analysis allow categorizing individual courses by multiple methods of interaction.

While the above test examined differences in persistence rates within each method of interaction, it did not examine differences between courses with dominant or mixed levels of each method of interaction. For example, an instructor in Course A may have used chat once per week, discussion once per week and email less than once per week while the instructor for Course B may have used chat less than once per week, discussion once per week and email less once per week. The question arises whether the possible combinations of levels of each method may result in differences in persistence rates between courses that are not detected when examining the persistence rate by one course method at time. In order to address this question, two new categorical variables were developed, Primary Method of Instructor Interaction and Primary Method of Student Interaction.

Primary Method of Instructor Interaction was coded by assigning a category to each course based on the course's dominant instructor method of interaction. The categories for this variable included Chat, Chat/Discussion, Discussion, Discussion/Email, Email and All Methods Equally. As discussed in Chapter III, each course was assigned to a category based on the course's highest median score on each of the three instructor frequency of interaction by method variables. The percentage distribution of courses by primary method of instructor interaction is contained in Figure 11.

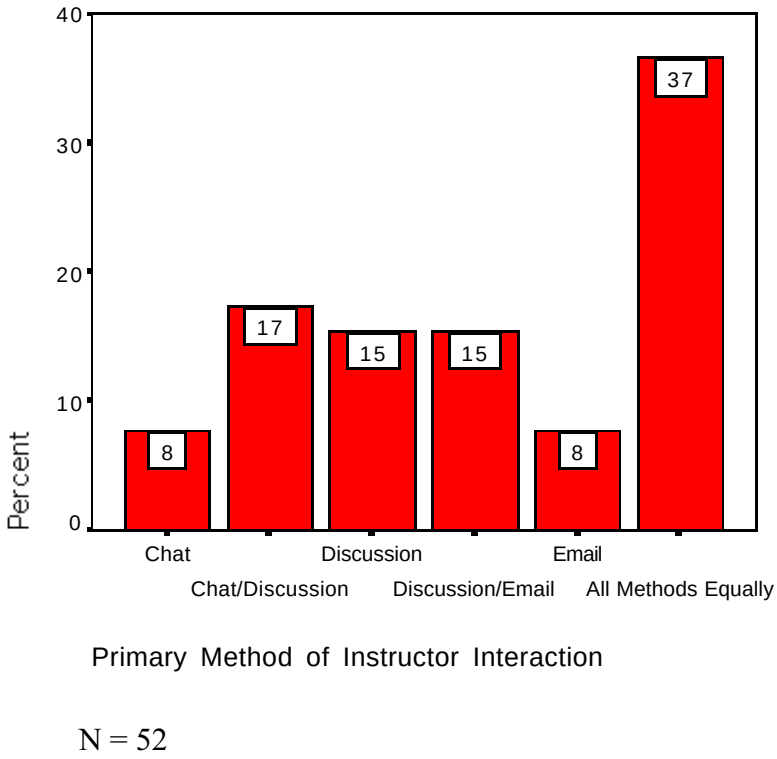


Figure 11. Percentage Distribution of Courses by Primary Method of Instructor Interaction.

The majority of courses (37%) reported that all methods were used equally. The distribution of courses reporting primary use of Discussion, Discussion/Email and Chat/Discussion ranged between 15% and 17%. Primary use of Chat and primary use of Email were reported by 8% of the courses, respectively.

Once each course was assigned to a primary method of instructor interaction category a one-way analysis of variance (ANOVA) was conducted to determine if a significant difference in persistence rates existed between courses with different primary methods of instructor interaction. Primary Method of Instructor Interaction was selected

as the independent variable, with the six categories described above, and the Transformed Persistence Rate was selected as the dependent variable. The results of this ANOVA are highlighted in Table 18. No significant differences were identified between the group mean persistence rate and the within group persistence rates meaning the null hypothesis is accepted.

Table 18

One-Way Analysis of Variance Summary for Transformed Persistence Rate by Primary Method of Instructor Interaction

	df	SS	MS	F
Between Groups	5	.01	.00	1.13
Within Group	46	.11	.00	
Total	51	.12		

Note: A separate analysis, conducted with the Raw Persistence data and each interaction variable, confirmed these findings.

Primary Method of Student Interaction was coded in a similar manner as Primary Method of Instructor Interaction, except that the highest median score on each of the three student frequency of interaction by method variables were used for category assignment. The majority of courses (44%) reported that Discussion was the primary method of interaction by students. The combination of Chat/Discussion was identified as the primary method of student interaction by 27% of the courses. The percentage distribution of courses by primary method of student interaction is contained in Figure 12.

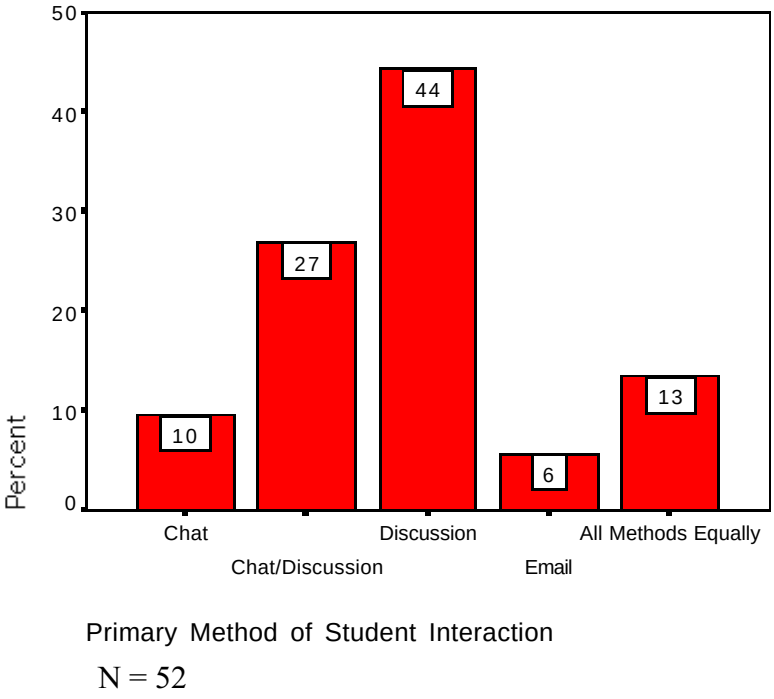


Figure 12. Percentage Distribution of Courses by Primary Method of Student Interaction.

Once each course was assigned to a primary method of student interaction category an ANOVA was conducted to determine if a significant difference in persistence rates existed between courses with different primary methods of student interaction. Primary Method of Student Interaction was selected as the independent variable with the five categories described above and the Transformed Persistence Rate was selected as the dependent variable. The results of this ANOVA are highlighted in Table 19. No significant differences were identified between the group mean persistence rate and the within group persistence rates meaning the null hypothesis is accepted.

Table 19

One-Way Analysis of Variance Summary for Transformed Persistence Rate by Primary Student Method of Interaction

	df	SS	MS	F
Between Groups	4	.01	.00	1.11
Within Group	47	.11	.00	
Total	51	.12		

Note: A separate analysis, conducted with the Raw Persistence data and each interaction variable, confirmed these findings.

Summary of Research Question 2

Using both a correlational and categorical analysis, this researcher both confirmed earlier findings regarding the positive relationship between instructor frequency of interaction and student frequency of interaction while identifying differences in the use of the three methods of interaction (i.e., chat, discussion forum, email lists) available to instructors and students in the online courses participating in this study.

Approximately one third of the courses (37%) reported their instructors used all three methods equally. This differed from student use of per course methods. Students reported their primary course method of interaction were discussion forums (44%) followed by discussion/chat (27%).

A strong positive correlation was identified between the frequency of instructor use of a specific method of interaction and the frequency of student use of that same method of interaction. However instructors typically use chat and email distributions lists more frequently than the students in their course. This positive relationship between

the frequency of instructor use of a specific method of interaction and student use of that same method supports the finding in Research Question One that overall frequency of instructor interaction is positively related to overall frequency of student use of interaction.

While there is a relationship between instructor and student use of specific methods of interaction, there does not appear to be a linear relationship between the use of a specific method of interaction and student persistence. In fact, both correlational and categorical analysis suggests that in this sample, there is no difference in student persistence rates based on the use of a specific method, or combination of methods, of interaction.

Research Question 3: Do the reasons students provide for failure to persist in online courses differ based on the frequency or method of instructional interaction?

The following data were obtained to answer this research question: a) the reasons non-persisters provided for withdrawing from their online course, b) the reasons persisters provided for not taking a subsequent online course and c) the reasons persisters provided for taking a subsequent course. Before proceeding with this analysis, it is important to remind the reader that the non-persister data are based on the responses of students who voluntarily withdrew from their online course and does not include responses of students who received an incomplete or failed their online course.

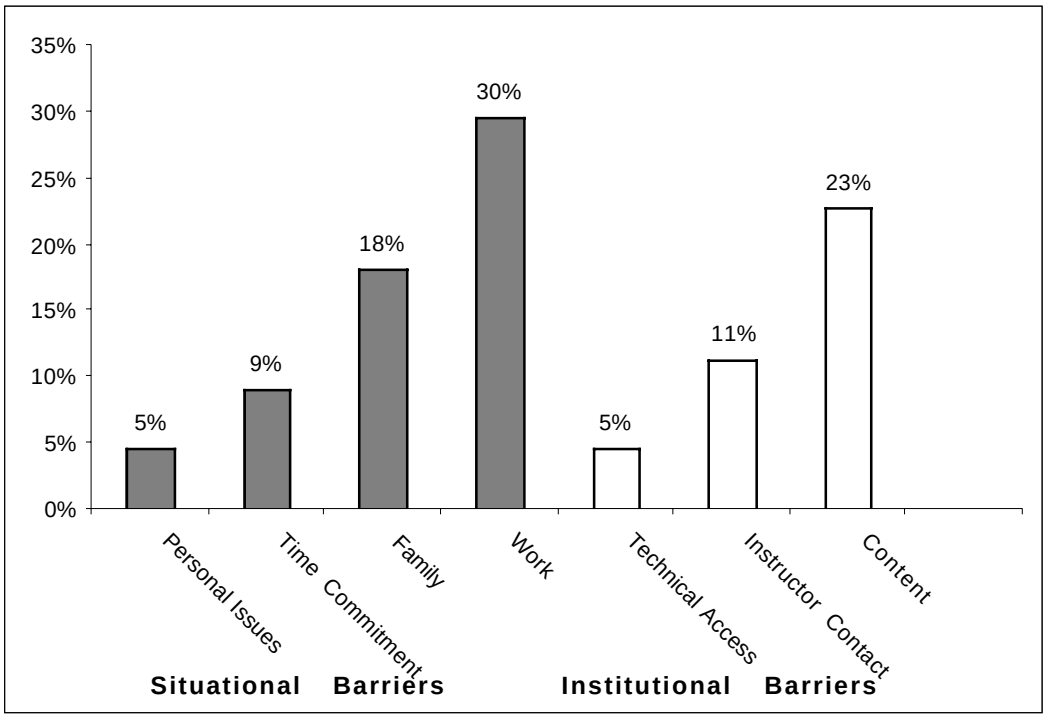
As discussed earlier in Chapter III, 45% (N=102) of non-persisters participated in a telephone interview or completed a mail survey. Multiple attempts were made to secure a response from at least one non-persister per course, however respondents from only 25 (46%) out of the 52 courses participating in the study completed a non-persister survey. While some courses had two to three respondents, others had one or no respondents. Given this dataset, the researcher restricted his analysis for Research Question Three to an examination of student-based, rather than aggregate, course-based responses. This limitation precluded an examination of differences based on the frequency or method of course-based interaction. Instead, this discussion focused on examining the reasons for failure to persist as well as examining differences between persisters and non-persisters in regards to their intent to take another online course in the subsequent semester. Statistical analysis included the observation of frequencies and percentages, cross tabulation and Chi Square analysis.

Reasons for Withdrawal

Reasons for withdrawal were only collected from the non-persister sample. The non-persister survey asked respondents to identify their primary reason for not completing their online course. The initial list of values presented to respondents reflected the range of situational and institutional barriers presented in Chapter II as reasons for student dropout. Situational barriers included the following reasons: (a) family commitments, (b) work commitments, and (c) financial reasons. Institutional barriers included: (a) course content not what student expected, (b) contact with instructor was not what student expected, (c) contact with classmates was not what

student expected, and (d) student experienced technical difficulties while accessing course materials.

An initial review of the other reasons students provided for withdrawing from their online courses suggested that two additional situational categories be added to this list, time commitment and personal issues. These two categories were added as values and each item was recoded. All 46 respondents provided primary reasons for withdrawal. Figure 13 presents the percentage distribution of this data.



n = 46

Figure 13. Percentage Distribution of Non-persister Reasons for Withdrawal.

Situational barriers accounted for 62% of the reasons provided for withdrawing from an online course, while institutional barriers accounted for 39% of the reasons[1]. The primary reason identified by non-persisters for failure to complete their online course was work commitments (30%), followed by content not what the student expected (23%), family commitments (18%) and unmet expectations regarding contact with their instructor (11%). It is interesting to note that two responses were not selected by any of the respondents. These responses were: (a) I learned what I needed to know before completing the course; and (b) Contact with classmates was not what I expected. The first response is often identified in the literature as one of the reasons adult students withdraw from their courses while the second response reflects the social motivation often identified as a reason adult students pursue a further education.

Intent to Return

Intent to return represents a student-based, rather than a course-based, measure of student persistence in online courses. Data regarding intent to return was collected from both persisters and non-persisters. This item, which asked students if they intended to return, indicated whether or not students who required additional courses in their program of study intended to take these additional courses online. Since the data reported by students in response to this item only represented students who required additional courses in their program of study, it was not possible to calculate per course

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[1] A low percentage of "other" responses were removed for discussion purposes in Figures 13, 14 and 15.

intent to return rates. The percentage of students not included in the analysis of this item ranged from a low of 9% in one course up to 57% in several courses. While these data did not provide an indicator of persistence within a course, it did provide an indicator of student intentions to persist in a program of study.

As discussed earlier in this chapter, student responses were first filtered by an item that asked if students needed to take additional courses in their program of study. Of the 469 persisters who indicated they needed to take additional courses in their program of study, 86% indicated they planned to take this course online in the subsequent semester. Of the 26 non-persisters who indicated they needed to take additional courses in their program of study, 57% indicated they intended to take an online course in the subsequent semester.

A two-way contingency table analysis was conducted to evaluate the difference between persisters and non-persisters in regard to both their enrollment in a certificate or degree program and their intent to take another online course. The results of these analyses, including the Pearson X^2 value and p value, are shown in Table 20. Persisters were significantly more likely to be enrolled in a degree or certificate program than non-persisters and were also significantly more likely to indicate that they intended to take another online course in the subsequent semester.

Table 20

Contingency Table Analysis Between Persisters & Non-persisters in Regard to Certificate/Degree Status and Intent to Return

	Persister	Non-persister	χ^2
Enrolled in Degree Program			5.03*
Yes	72.0	56.5	
No	28.0	43.5	
	N=714	N=46	
Intent to Return			15.74***
Yes	86.4	57.7	
No	13.6	42.3	
	N=469	N=26	

Note. Values represent % within persister and non-persister groups.

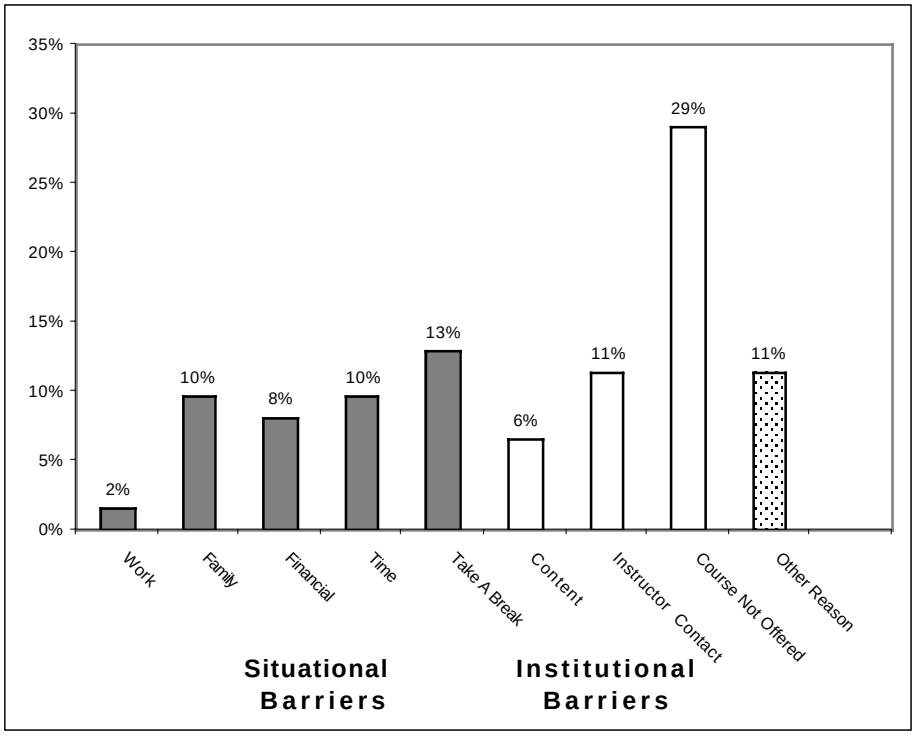
df=1, * p < .05, ** p < .01, *** p < .001

In addition to asking respondents if they intended to take an online course in the subsequent semester, both the persister and non-persister surveys asked respondents to indicate why they intended to take an online course or why they did not intend to take an online course. Open-ended response boxes were provided on both the persister and non-persister surveys. These open-ended responses were then coded by the researcher and a research assistant according to the qualitative methodology presented in Chapter III. Of the 405 persisters who indicated they intended to take another online course, 69% provided a reason for why they intended to return. Of the 64 persisters who indicated they did not intend to take another online course, 97% provided a reason.

The percentage of non-persisters providing a reason for either intent to return or to explain why they did not intend to return was smaller (i.e., 28% of 46 non-persisters) than that submitted by persisters (i.e., 73% of 469 persisters). This difference between

the non-persister and persister response rate for this item precludes an analysis or comparison of the non-persister comments. Therefore, the discussion of reasons students provided for intent to return or not return focuses only on the persister data.[2]

Persister reasons for not taking another online course were organized into situational and institutional barriers in a manner similar to the non-persister data discussed earlier in this chapter (Figure 14).



n = 62

Figure 14. Persister Reasons for Not Taking Another Online Course.

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[2] Of the 15 non-persisters who indicated they intended to take another online course, 6 provided a reason. Of the 11 non-persisters who indicated they did not intend to take another online course, 7 provided a reason.

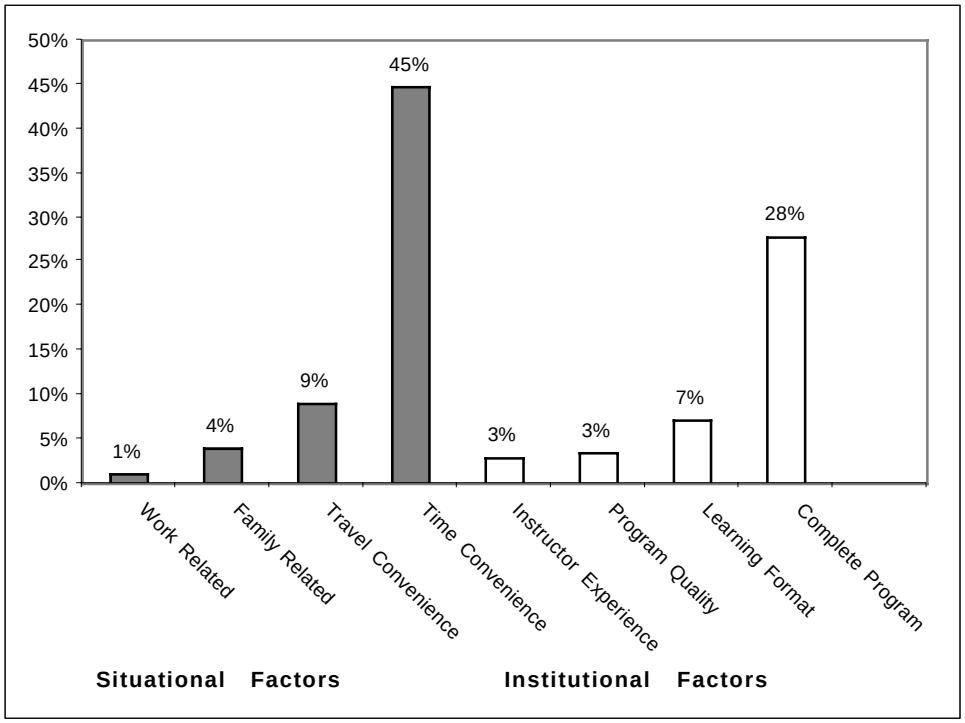
Situational barriers accounted for 40% of the reasons provided by persisters for not taking another online course while institutional barriers accounted for 46% of the reasons. The 11% of "other" responses did not fit into either category. The percentage distribution of reasons persisters provided for not taking another online course in the subsequent semester are displayed in Figure 14.

The primary reason provided by the 62 persisters who responded to this item for not taking an online course in the subsequent semester is that the course was not offered online (29%). This was followed by seven other situational and institutional barriers which each accounted for 8% to 13% of the reasons students provided for not taking another online course. It is interesting to note that the "Instructor contact" item accounted for 11% of the reasons provided by persisters for not taking another online course. This is consistent with the 11% of non-persisters discussed earlier in Research Question Three, who indicated they withdrew from their online course due to limited instructor contact.

One item, "Work commitments", was only identified by one persister as a reason for not taking another online course. This is in sharp contrast to the 28% of non-persisters who indicated that "Work commitments" was a reason they withdrew from their online course. This contrast is consistent with the situational data discussed earlier in this chapter that indicated that more non-persisters (66%) than persisters (52%) worked greater than 40 hours per week.

A review of reasons persisters provided for taking another online course in the subsequent semester are displayed in Figure 15. The responses were grouped according

to whether they were situational or institutional factors, similar to the situational and institutional barriers discussed above. The situational factors included the following reasons: (a) work-related, taking the online course to advance in a work-related position; (b) family commitment, taking the online course allowed students to fulfill family responsibilities; (c) travel convenience, taking the online course limited travel to the physical campus; and (d) time convenience, taking the online course saved the students time and/or fit their schedules.



n = 279

Figure 15. Persister Reasons for Taking Another Online Course.

Institutional factors included: (a) instructor experience, a previous positive online instructor experience promoted their desire to take another online course; (b) program

quality, the overall quality of the online program promoted their desire to take another online course; (c) learning format, the students found the learning format conducive to their learning style; and (d) complete program, the students needed additional online courses to complete a degree or certificate program.

Situational factors accounted for 59% of the reasons provided by persisters for taking another online course while institutional factors accounted for 41% of the reasons. The primary reason provided by the 279 students who responded to this item was convenience in regards to time and scheduling (45%). While this appears to be significantly more than any other situational or institutional factor identified by the respondents, it is important to keep in mind that this convenience allowed respondents to schedule and spend time with families, at work and engaged in other life activities. Nevertheless, the 45% of respondents who selected this reason identified the flexibility of an online course in regards to the anytime access to course materials and instruction as the primary reason for taking another online course. This was followed by an institutional factor, the need to complete an online degree or certificate program, by 28% of respondents. The remaining six reasons provided were each selected by less than 10% of the respondents.

Summary of Research Question 3

This research question originally proposed to examine differences in the reasons students provided for failure to persist in their online program based on the frequency and method of instructional interaction. However the data collected from non-persisters regarding reasons for withdrawal from online courses represented less than half of the

courses in the study. The courses that were represented typically reflected the comments of one to two students. For this reason, a decision was made to examine responses on a student, rather than a course level, which precluded the use of a course level frequency of interaction or method of interaction measure.

This research question examined the reasons non-persisters provided for withdrawing from their online courses, the reasons persisters provided for taking a future online course and the reasons persisters provided for not taking a future online course. Before conducting this analysis, the researcher examined differences between persisters and non-persister in regards to their enrollment in a degree or certificate program and their intent to take a future online course. Persisters were more likely to be enrolled in a certificate or degree program than non-persisters and were much more likely to take another online course in the subsequent semester.

The reasons students provided for withdrawal and for not taking a future online course were grouped into situational and institutional barriers. Situational barriers accounted for 62% of the reasons non-persisters provided for withdrawing from their online course while institutional barriers accounted for 39% of the reasons provided. The primary reason identified by non-persisters for withdrawing from their online course was work commitments (30%).

Persisters identified institutional barriers (46%) slightly ahead of situational barriers (40%) as the reason they did not intend to take a future online course. The primary institutional barriers persisters identified were that the course they required was not offered online (29%). While work commitments was the primary reason identified by

non-persisters for withdrawal from their online course, only one persister identified this as a reason for not taking a future online course.

Finally, situational factors accounted for 59% of the reasons persisters provided for taking an online course in the subsequent semester. The primary reason provided by persisters was that taking an online course was convenient in regards to time and their schedule (45%). Institutional factors accounted for 41% of the reasons provided by persisters, with 28% of students identifying the need to take an online course in order to complete a program of study.

The analysis conducted for this research question suggests that there may be some differences between non-persisters and persisters in regards to their commitment to completing a program of study as well as to the impact the number of hours worked per week has on a student's ability to persist in their online studies. This analysis also suggests that interaction with their instructor may account for a small percentage of the reason students persist within, or enroll in another, online course.

Research Question 4: Do other variables emerge as correlates of persistence among students in online courses?

In addition to examining the frequency and method of instructional interaction, the persister survey asked respondents to consider how other aspects of interaction contributed to their online course experience. These data, collected at the course level, were used to examine the relationship between persistence and: (a) student attitudes to interaction, (b) student attitudes regarding their online course experience, (c) student use of interaction methods to share course related materials, and (d) student perceptions regarding the contribution of a specific interaction method.

Attitude Indexes

As discussed in Chapter III, two attitude indexes were developed to measure persister attitudes to interaction within each online course and to measure persister attitudes to their online course experience. The Attitude to Interaction Index examined student attitudes to the: (a) timeliness of instructor feedback, (b) utility of instructor feedback, (c) amount of instructor communication, and (d) amount of student communication. The Attitude to Course Index asked students if: (a) the course contributed to their knowledge regarding the subject matter, (b) the course met students' expectations, and (c) they would recommend the course to another student. Student responses to each set of questions were summed at the course level and a mean attitude to interaction score and mean attitude to course score was calculated for each online

course. An initial review of the distribution of data for these two indexes approximated a normal distribution, supporting further correlational analysis.

An initial scatterplot matrix comparing frequency of instructor to student interaction and frequency of student to student interaction for each course to each of the attitude indexes suggested a positive, linear relationship existed between the frequency variables and the attitude indexes. A second scatterplot matrix comparing each of the method of interaction indexes for each course to each of the attitude indexes also suggested a positive, linear relationship between each method index and each attitude index. Pearson's Product Moment Correlation was used to evaluate the strength of the relationship between these two attitude indexes and: (a) the mean course frequency of instructor to student interaction score, (b) the mean course frequency of student to student interaction score, and (c) each of the three method of interaction indexes. Table 21 contains the results of this analysis.

Table 21

Intercorrelations of Per Course Attitude Scales by Per Course Frequency and Method of Interaction Scores

	Attitude to Interaction	Attitude to Course
N = 52		
Frequency of Instructor (to Student) Interaction	.62***	.41**
Frequency of Student (to Student) Interaction	.22	.07
Chat Index	.15	.09
Discussion Index	.55***	.39**
Email Index	.43**	.41**

2-tailed significance, *p<.05, **p<.01, ***p<.001

The mean course frequency of instructor to student interaction scores displayed a strong positive correlation to both per course attitude to interaction scores and attitude to course scores. A strong, positive relationship was also observed between the use of asynchronous methods of interaction within a course (i.e., discussion forum, email lists), and both per course attitude indexes. No relationship was observed between frequency of student interaction and either student attitude index.

A Pearson Product Moment Correlation was then used to examine the relationship between each courses' attitude to interaction and attitude to course scores and each courses' transformed persistence rate. The results of this analysis are contained in Table 22.

Table 22

Intercorrelations of Per Course Attitude Indexes and Transformed Persistence Rates

	Transformed Persistence Rate
N = 52	
Attitude to Interaction	-.30*
Attitude to Course	-.24

Note: A separate analysis, conducted with the Raw Persistence data and each attitude index, confirmed these findings.
2-tailed significance, *$p<.05$

When examining all 52 courses included in the study, a modest, positive correlation was observed between course attitude to interaction scores and transformed persistence rates ($p\leq.05$). However, when the three extremely low persistence cases discussed earlier in this chapter are removed from the analysis, the correlation is not

observed. In some respects this is understandable, given that the majority of persistence rates are .80 or higher. When one removes the three extremely low persistence cases (cases 759, 786 and 802), the distribution of data are further negatively skewed and the relationship is obscured. This said, the analysis would be strengthened by a broader representation of low persistence cases.

Course Related Usage by Method

In addition to examining the frequency and method of interaction, three items on the persister survey asked online students if they used the various course communications tools to share course related resources; such as online links, attachments, presentations and written assignments; with their classmates. The creation of these three Course Related Usage items is discussed in detail in Chapter III. Courses were grouped according to the percentage of students reporting usage of a specific method of interaction to share course related resources. The distribution of per course ranking is described in Table 23 below.

Table 23

Distribution of Courses by Sharing Resource Method

	Chat Resource Share		Discussion Resource Share		Email Resource Share	
Characteristics	n	%	n	%	n	%
Less than 50% shared resources	33	73.3	24	51.1	24	64.9
50% or more shared resources	12	26.7	23	48.9	13	35.1

Students used the discussion forum the most for sharing course related materials, with over 49% (N=47) of the courses indicating that 50% or more students per course used discussion to share course related materials. Email lists and chat were used less than discussion forums for the sharing of course related materials. Email lists were used by 50% or more students for sharing course related materials in 35% (N=37) of the courses while chat was used by 50% or more students for sharing course related materials in 27% (N=45) of the courses.

Once levels of sharing course related materials were established for each course, by each method of interaction, these levels were used to explore differences between courses in regard to their: (a) persistence rate, (b) attitude to interaction index score, (c) attitude to course index score, and (d) the frequency of instructor to student and student to student interaction (i.e., the Interaction Index). A series of three-way ANOVA were conducted to evaluate the effects of the level of sharing course related materials within each method of interaction to each of these variables. The level of sharing course related materials had a significant effect only on the Interaction Index. The means and standard error for the Interaction Index as a function of the three methods of interaction are presented in Table 24. The ANOVA indicated no significant interaction between the methods of interaction but indicated significant main effects for levels of sharing course related materials within the discussion method of interaction, $F(1,23)=4.30$, $p<.05$, partial $\eta^2 = .16$. The discussion main effect indicated that the Interaction Index scores were significantly higher in courses where 50% or more of the students used the

discussion forum to share course related materials than it was in courses where less than 50% of the students used the discussion forum to share course related materials.

Table 24

Three-Way Analysis of Variance for Effects of Course Related Usage per Method on Interaction Index

Method of Interaction	Usage Level	M	SE
Chat	Less than 50% shared resources	2.89	.07
	50% or more shared resources	3.02	.12
Discussion Forum	Less than 50% shared resources	2.75	.12
	50% or more shared resources	3.09	.07
Email Lists	Less than 50% shared resources	2.97	.07
	50% or more shared resources	2.92	.10

Contribution by Method

Three course level measures were created to examine students' perceptions regarding the contribution each method of interaction made to their online learning experience. The creation of these measures is discussed in Chapter III. An initial review of the distribution of per course responses approximated a normal distribution, supporting the use of these items in further correlational analysis. An initial scatterplot of course scores for each of the three items suggested a positive relationship existed between the discussion contribution item and persistence, as well as between the

discussion and chat contribution items and the Interaction Index score for each course. A Pearson Product Moment Correlation was conducted to examine the strength of these relationships. The results of these analyses are included in Table 25.

Table 25

Intercorrelations of Per Course Contribution Items to Interaction Index and Transformed Persistence Rate

	Interaction Index	Transformed Persistence Rate	n
Chat Contribution	.47**	-.01	51
Discussion Contribution	.64***	-.41**	52
Email Contribution	.16	-.21	52

Note: A separate analysis, conducted with the Raw Persistence data and each contribution variable, confirmed these findings.
2-tailed significance, * $p < .05$, ** $p < .01$, *** $p < .001$

A strong positive correlation was observed between course Interaction Index scores and course Discussion Contribution ($p < .001$) and Chat Contribution scores ($p < .01$). A strong positive correlation was also observed between course Transformed Persistence Rates and course Discussion Contribution scores ($p < .01$).

A review of the correlation matrix between course Contribution by Method scores and the Method of Interaction Index scores, presented in Table 26, suggests a significant correlation between each Contribution by Method variable and the corresponding Method of Interaction Index ($p<.001$) . This finding suggests that as the overall use of a specific method of interaction increases within a course, students'

perceptions regarding the contribution of the method to their online learning experience improves.

Table 26

Intercorrelations between Contribution by Method and Method of Interaction Variables

Method of Interaction	Chat Method Index (n =51)	Discussion Method Index (n =52)	Email Method Index (n =52)
Chat Contribution	.70***	.24	.10
Discussion Forum Contribution	.16	.84***	.29*
Email Lists Contribution	.08	.39**	.57***

2-tailed significance, * p < .05, ** p < .01, *** p < .001

A more modest correlation is observed between the Discussion Method Index and the email contribution variable (p<.01). A similar modest correlation is observed between the Email Method Index and the discussion contribution variable (p<.05). This is not surprising given the percentage of courses (69%, N = 52) that combined the use of the discussion forum with the use of chat, email or both (see Figure 11, p. 120).

Relationship of Discussion Forum Use to Persistence

The emergence of the different uses, and student perceptions regarding the uses, of the discussion forum as a correlate to persistence suggested the use of multiple linear regression to better understand the relationship the use of discussion forums has with persistence. A multiple regression analysis was conducted to evaluate how well the contribution by method variables and method of interaction indexes predicted persistence. The results of this analysis are displayed in Tables 27 and 28 below.

Table 27

Means, Standard Deviations, and Intercorrelations for Transformed Persistence Rate and Method of Interaction Index and Contribution Scores

Variable	M	SD	1	2	3	4	5	6
Transformed Persistence Rate	1.09	.05	-.41**	-.01	-.21	-.17	.05	-.07
Predictor Variable								
1. Discussion Contribution	2.93	.46	--	.40**	.54***	.84***	.16	.29*
2. Chat Contribution	2.80	.42		--	.16	.24*	.70***	.10
3. Email Contribution	2.76	.33			--	.39**	.08	.57***
4. Discussion Index	9.00	2.00				--	.14	.23
5. Chat Index	8.08	1.66					--	.10
6. Email Index	6.87	1.02						--

Note: A separate analysis, conducted with the Raw Persistence Rate and the same predictor variables, confirmed these findings.
$p<.05$, $**p<.01$, $***p<.001$

Table 28

Regression Analysis Summary for Method of Interaction Index and Contribution Scores Predicting Transformed Persistence Rate

Step	Variable	B	SEB	B	R^2	ΔR^2
Step 1					.17**	
	Discussion Contribution	-.04	.01	-.41**		
Step 2					.26*	.10
	Discussion Contribution	-.09	.02	-.88**		
	Discussion Index	.01	.01	.57*		

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

The predictors included the three contribution of method variables and the three method of interaction indexes. The Transformed Persistence Rate was the criterion

variable. A stepwise multiple linear regression analyses was conducted. The Contribution by Discussion Method variable and the Discussion Method Index were significantly related to the Transformed Persistence Rate, F (2,48)=8.87, p=.001. The sample multiple correlation coefficient was .51, indicating that approximately 26% of the variance in the persistence rate in the sample can be accounted for by the linear combination of these two measures. The remaining Contribution by Method and Method of Interaction variables did not add to the predictive value of the equation.

Summary of Research Question 4

The researcher examined the relationship between persister attitudes, use of interaction methods and persistence among students enrolled in online courses. Two attitude indexes were created which examined student attitudes to interaction within their online course and to their online course experience. Strong, positive correlations were observed at the course level between attitudes to interaction and: (a) the frequency of instructor to student interaction , (b) the Discussion Method Index, and (d) the Email Method Index. Similar positive correlations were observed at the course level between attitudes to students' online course experience and the same three variables. A modest, positive correlation was observed between per course attitudes to interaction and course persistence rates.

In addition to examining the frequency and amount of interaction, the researcher examined how students used methods of interaction among courses. Specifically, three measures were created which examined the percentage of students within a course who used the three methods of interaction to share course related materials. Course discussion

forums were used most frequently by 50% or more of the students within a course to share course related materials.

Finally, students were asked if the use of each of the methods of interaction contributed to their online learning experience within a specific course. A strong, positive correlation was observed between positive attitudes regarding the contribution of discussion forum use within a course to course persistence rates. A regression equation was created using the Contribution by Discussion Method variable and the Discussion Method Index which accounted for 26% of the variance in course persistence rates for this sample.

These analyses indicate that use of the discussion forum is positively correlated to: (a) the frequency of instructor to student interaction within a course, (b) positive course attitude to interaction ratings, (c) positive course attitude to the online course ratings, and (d) positive course attitudes regarding the contribution of the discussion forum. Furthermore, the combination of discussion forum use and students' perception that discussion forum use contributes to their online learning experience appear to be predictive of persistence in online courses.

CHAPTER V

DISCUSSION OF FINDINGS AND IMPLICATIONS FOR FUTURE RESEARCH

This research study examined the relationship between instructional interaction in online courses and student persistence in these courses. The results of this study indicate that while there may not be a direct relationship between the frequency or method of interaction and persistence in online courses, there is an indirect relationship supported by multiple factors including: (a) student perceptions and attitudes toward the frequency and method of interaction within online courses, (b) situational and institutional barriers to persistence among students in online courses, and (c) factors that appear to facilitate student participation in online courses. The discussion that follows will first examine how the research findings support each of these factors and then discuss implications for practice and future research.

Instructional Interaction and Persistence

This study defined instructional interaction as communication between an instructor and students, or between two or more students, which discusses some aspect of course content, assignment or student progress in the course or program (Kearsley, 1995; Wagner, 1994). Since the study examined instructional interaction between instructors and students participating in online education, course communications were mediated by

computer technology. As discussed in detail in Chapter III, the online program participating in this study used a learning management system which supported three methods of computer mediated communications: synchronous chat, asynchronous discussion forum and asynchronous email.

Instructional interaction was examined through student-reported survey data which measured: (a) the frequency of course related communication between instructor and students, (b) the frequency of course related communication among students, (c) the frequency and duration of instructor and student use of each method of interaction, and (d) the primary methods of instructor and student communication within each course[3]. A course persistence rate was calculated as a percentage of students who maintained enrollment in a course throughout the academic semester. These measures allowed the researcher to conduct both a correlational and categorical analysis of the relationship between instructional interaction and student persistence in online courses.

This researcher found that the overall frequency of instructor to student interaction in each course was positively correlated to the frequency of student to student interaction. While instructor to student and student to student interaction were correlated, instructor to student interaction occurred more frequently than student to student interaction. Consistent with this relationship between instructor to student interaction and student to student interaction, a strong positive correlation was identified between the

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[3] The criterion-related validity of this student-reported survey data was established by comparing student-reported data to the actual course communication archives in 20% of the courses participating in this study (see Chapter III).

frequency of instructor use of a specific method of interaction and the frequency of student use of the same method of interaction. While instructor use of a specific method of interaction was related to student use of the same method, instructors typically used synchronous chat and asynchronous email on a more frequent basis than their students. This finding suggests that while instructors may have used chat sessions and email lists on a weekly, or more frequent basis, a majority of students enrolled in each course did not use these methods of interaction as frequently as their instructor. Within courses, instructors and students used asynchronous discussion forums with approximately the same frequency.

Per course measures identifying the primary methods of instructor and of student interaction found that instructors and students used course methods of interaction differently. Approximately one third of the courses reported that their instructors used all methods of interaction equally, while only 13% of the courses reported that students used all methods equally. Another 45% of the instructors primarily used the discussion forum, or the discussion forum in combination with either email or chat to communicate with their students. The primary method of student interaction was the asynchronous discussion forum (44%), followed by the use of discussion combined with synchronous chat (27%). This study did not observe a direct relationship between the frequency of interaction or the method of interaction and student persistence.

This study did make an important contribution to research on online education by validating the use of student reported survey data as a measure of instructor and student interaction in online courses. As discussed in Chapter III, the researcher compared the student reported survey data from 20% of the courses in the study with the actual course

archives and found that the student reported data accurately reflected the frequency of instructor and student interaction in each course. In addition, the strong, positive correlation between the frequency of instructor and frequency of student interaction in each course suggests the Interaction Index created by the researcher for this study provides an accurate measure of the overall, instructional interaction that occurs in each online course.

While the researcher did not observe a direct relationship between the frequency or method of instructional interaction and persistence, positive correlations were observed between instructor to student interaction, the overall frequency of interaction, and student attitudes to interaction and their online course experience. These relationships, along with a discussion of the reasons students withdrew or persisted are presented next.

Student Perceptions and Attitudes

The examination of students' attitudes towards their online course experience offered the only statistical evidence of a relationship to persistence in this study. As discussed in Chapter IV, student attitudes to feedback and the amount of interaction in their online courses were modestly correlated to course persistence rates. Students' perceptions regarding the contribution that the use of a specific method of interaction (i.e., discussion forum) made to their online course experience were strongly correlated to course persistence rates. In each of these situations, student attitudes were related to the multiple dimensions of interaction discussed earlier in Chapter II. These multiple dimensions, (timeliness of feedback, duration of feedback, frequency, method), help to

define the instructional interaction that occurs within the online course and also help to define the students' online course experience (Garrison, 1987; Holmberg, 1995; Moore & Kearsley, 1995; Smith & Dillon, 1999).

In regard to student attitudes to interaction, the data indicate that positive student ratings regarding the timeliness of instructor feedback, appropriateness of instructor feedback and amount of course communications increased in courses as the use of asynchronous methods of interaction increased (i.e., discussion forum, email lists). Likewise, as the frequency of instructor to student interaction in a course increased, student attitudes to interaction and to the online course experience improved. This positive correlation to student attitudes was not observed in courses where the primary method of instructor interaction was chat. This is an interesting observation since one might reasonably suspect that chat; which provides immediate, synchronous feedback between students and instructors; would be rated more highly in regard to the timeliness of feedback and interaction than either the discussion forum or email lists.

Student perceptions regarding the contribution that the use of discussion forums made to their online course experience were strongly correlated to course persistence rates. This was not observed for student perceptions regarding the contribution the use of chat or the use of email lists made to the students' online course experience. The data also indicate that courses where more than 50% of the students used the discussion forum for the sharing of course related materials demonstrated a higher overall frequency of interaction than courses where less than 50% of the students used the discussion forum to share course related materials.

While the frequency of instructor to student interaction was positively correlated to student attitudes to interaction and to their online course experience, this relationship was not observed in courses as the frequency of student to student interaction increased. This lack of a discernable relationship between student to student interaction and student attitudes is curious. One of the often identified benefits of online education is the ability to support increased communication among students in an effort to support a collaborative, or constructivist, approach to education (Dede, 2000; Kearsley & Shneiderman, 1999; Knowlton, 2000; Rhodes, 1998; Spira, 1998). The data in this study indicate that increased interaction among students is not related to student attitudes to interaction or to student attitudes to their online course experience. While these findings do not contradict the potential benefits of a collaborative, online learning environment they do suggest the need to closely examine the application of online education to collaborative, or constructivist, pedagogy.

Given the positive relationship observed: (a) between student attitudes to interaction and student persistence; and (b) between student perceptions regarding the use of the discussion forum, the frequency of discussion forum use and student persistence; this study suggests that frequent use of the asynchronous discussion forum by the instructor and students to share course related materials is one factor contributing to student persistence.

Situational And Institutional Barriers To Persistence

In addition to the statistical analysis conducted examining the relationship between frequency or method of interaction and persistence, this study examined

situational and demographic characteristics of the students enrolled in the online program. As discussed in Chapter IV, over 80% of the students participating in the study were 25 years or older, while 79% (persisters) to 86% (non-persisters) of the respondents worked more than 30 hours per week while attending online classes. These student demographics reflect characteristics typically associated with adult learners (Marineau & Chickering, 1982; Pappas & Loring, 1985), suggesting that, in regard to this study, the findings apply to adult students enrolled in an online education program and not necessarily to the traditional, 18 to 22 year old undergraduate college students enrolled full-time in an on-campus degree program.

This situational and demographic data was used to compare characteristics of students who persisted to those who did not. Qualitative data was collected which supported an examination of the reasons students provided for withdrawing from their current course or for not enrolling in a subsequent online course. In regard to demographic and situational characteristics, persisters and non-persisters had much in common. Both groups were similarly distributed in respect to age, gender, children living at home, primary adult role and previous years of Internet experience. However, several differences emerged between these groups that may have impacted their decision to persist or withdraw.

First, a larger percentage of non-persisters than persisters reported working more than 40 hours per week for pay. While the difference was not statistically significant, there was a 14 percentage point difference between the number of persisters and non-persisters who reported working more than 40 hours per week. Second, a significantly larger percentage of persisters were enrolled in a certificate or degree program and third,

a significantly larger percentage of persisters indicated they intended to take another online course in a subsequent semester. A review of the reasons persisters and non-persisters provided for withdrawing from, or continuing, their studies appear closely related to these situational differences.

Situational barriers -- comprised primarily of student work commitments, student family commitments and student time commitments -- accounted for the majority of reasons non-persisters provided for withdrawing from their online course. Work commitments was the reason identified by one-third of non-persisters for withdrawing from their online course, followed by family commitments. This compares to persister reasons for not enrolling in another online course, where only one persister identified work commitments as the reason for not taking an online course in the subsequent semester. Persister situational barriers were comprised primarily of student family commitments, financial costs, student time commitments and the self-identified "need to take a break."

Institutional barriers accounted for slightly more than one third of the reasons non-persisters provided for withdrawing from their online course. The primary institutional barriers identified by non-persisters included: (a) the course content did not meet their expectations, and (b) the instructor contact was not what the student expected. Approximately one-third of the persisters who indicated they did not intend to return to an online course in the subsequent semester identified an institutional barrier, the course they needed was not offered online. This reason was followed by the two institutional barriers identified above for non-persisters: (a) the instructor contact was not what the student expected and, (b) the course content was not what the student expected.

It is important to note that the same percentage of non-persisters and persisters (i.e., 11% of each category) each identified the reason "the instructor contact was not what I expected" for withdrawing from their current, or not enrolling in a future, online course. This reason reflects unmet student expectations regarding instructional interaction and deserves further consideration. While the design of this study did not support an analysis of student reasons for failure to persist on a per course basis (due to the statistically low number of per course non-persister responses), future studies may benefit from a closer examination of student expectations regarding various dimensions of instructor interaction. The identification of this barrier also suggests the need to more clearly communicate to students the nature of instructor interaction in online courses.

While the difference in the percentage of persisters and non-persisters who worked 40 hours or more per week for pay may not have been statistically significant, the difference in reasons provided by persisters and non-persisters strongly suggests that working more than 40 hours per week influenced the non-persisters' decision to withdraw from their courses. This finding is consistent with previous research that has identified student work commitments as a major contributing factor to a student's decision to withdraw from a course, whether the course is delivered through technology or meets face to face (Fjortoft, 1995; Kerka, 1995; Lu, 1997, Pappas & Loring, 1985). It is also interesting to note that non-persisters were more likely than persisters to select situational barriers as their reasons for withdrawing or not taking a future online course. Persisters were evenly split between situational and institutional reasons for not taking a future online course while non-persisters were twice as likely to select situational over institutional reasons for withdrawing.

The fact that a significantly larger percentage of persisters than non-persisters were enrolled in a certificate or degree program suggests that student commitment to complete a program of study influences a student's decision to persist or withdraw from a course. This finding is consistent with the literature that identifies motivation and goal commitment as critical to a student's decision to persist in a program of study (Fjortoft, 1995; Garrison, 1987; Loring, 1985; Lu, 1997; Pappas & Taylor, 1986). The fact that a majority of persisters were enrolled in a certificate or degree program likely also relates to their decision to take a subsequent online course. In fact, the number of persisters who indicated they would take a future online course would likely increase significantly if the online program expanded its course offerings to reflect the courses needed by students to complete current online certificate and degree programs. Approximately one-third of the persister reasons provided for not taking a subsequent online course were that the institution was not offering the courses needed.

Two reasons for withdrawal not identified by either persisters or non-persisters in this study, included: (a) I learned what I needed to know before completing the course; and (b) contact with classmates was not what I expected. These reasons were included in the survey to reflect the "learning for the sake of learning" motivation of some adult students, and the socially oriented motivation of other adult students (Cross, 1981; Houle, 1961; Knowles, Holton et al., 1998). The fact that neither the non-persisters nor the persisters selected either of these as a primary reason for withdrawing from, or not taking a future, online course suggests that these motivations were either met by the students in the program, or were not as important as other factors to the students in this population.

Persister Reasons for Intent to Return

The previous section summarized the reasons non-persisters and persisters provided for withdrawing from, or not enrolling in future, online courses. This section will summarize the two primary reasons persisters provided for their intention to take another online course in the subsequent semester. As discussed in Chapter IV, persisters who indicated they planned to take another online course in the subsequent semester were asked to provide a reason for why they intended to take the course. The review of responses to this question indicated that almost half of the students who intended to take another online course were doing it because online courses were convenient in regard to the time commitment and schedule. While this convenience allowed these students to fulfill other family, work and social commitments, these students clearly identified the flexibility of an online course in terms of anytime access to course materials and instruction, as the primary reason for taking another online course. This finding is consistent with the literature that identified time constraints as a primary reason for student enrollment in distance education courses (Hezel & Dirr, 1991; Liviertos & Frank, 1992; Zernike, 1999).

Approximately one-third of the persisters who indicated that they were taking another online course stated they were taking an online course to complete their program of study. This finding likely reflects the motivation and goal commitment of students enrolled in a certificate or degree program to complete that program of study. This is consistent with Tinto's observation that as students' commitment to an institution and goal increase, they are less likely to drop out of that institution (Pascarella & Terenzini,

1991; Tinto, 1987). This finding suggests that one strategy for supporting persistence among online students is to facilitate their matriculation into certificate or degree programs.

Implications for Practice and Research

The findings discussed above indicate that there is a relationship between instructor use of asynchronous discussion forums and student attitudes towards their online course experience. These findings also indicate that positive student attitudes toward interaction and the students' online course experience, combined with instructor use of asynchronous discussion forums are positively related to student persistence. While the frequent use of a specific method of interaction is indirectly related to student persistence, students also identified intervening situational and institutional barriers that contributed to their decision to withdraw from, or not enroll in, an online course. This combination of instructional, situational and institutional factors suggests several strategies for faculty development, technology development, program development and future research.

Faculty Development

The results of this study suggest two approaches may be appropriate in the development and training of faculty who will teach adult students in online courses. First, a discussion with faculty regarding who online students are, what motivates online student participation, and what barriers online students confront while pursuing an education, may assist in addressing the situational and instructional barriers discussed

above. This discussion first requires that the educational institution has a clear sense of who their students are. While this study was conducted with students who were primarily adult learners, other institutions may enroll different student populations. The techniques and strategies that engage adult students may not be appropriate for residential, on-campus students in the 18 – 22 year old age bracket.

The fact that adult students typically have multiple roles; and that work and family commitments compete with the adult students' ability to participate in, and persist in, their education; is important for faculty to consider in the development and teaching of their online course. This is not to suggest that online courses for adult students should be less academically challenging than on-campus courses. It does clearly suggest that time-based activities, such as synchronous text or voice chat, are more difficult for adult students to participate in than asynchronous activities facilitated through a discussion forum or email. While the use of text-based chat may be familiar to some faculty and students due to the real-time nature of the interaction, this study suggests that synchronous chat may not be a particularly effective way to reach and engage adult students.

The shift from synchronous communication methods to asynchronous communication methods requires changes on both the part of faculty and students. Faculty and students may require technical training in how to use asynchronous communication methods. While students may be technically familiar with how email or a discussion forum work, faculty will need to explicitly state how these tools will be used within the online course. How will these tools be used for the distribution and collection of course assignments and student projects? How often do students need to

review discussion forums and email? How often do students need to respond? What is considered an adequate, or a quality, student response?

In addition to course management issues, faculty will need to consider how asynchronous communication methods will impact the teaching and learning process. Do students have more time to reflect on questions and assignments? How will the course dynamic change if students post questions, answers and comments directly to a common discussion forum, rather than responding directly to instructor comments? These and many other questions emerge as faculty and students begin to integrate asynchronous communication methods into the teaching and learning process. Both groups will benefit from clear guidelines regarding the technical use and classroom application of this technology.

Technology Development

This study examined the instructional use of three computer mediated communication methods provided by the learning management system (LMS) in use by the institution participating in the study. These three methods included synchronous text-based chat, asynchronous text-based discussion forums and asynchronous email lists. At the time of the study, the LMS did not support synchronous video conferencing or voice chat. While all three methods of communication supported the ability to share course related attachments with the instructor and classmates, students used the discussion forum more frequently than email or chat to share course related materials. This study did not examine why this was the case, however future research regarding the reasons students and faculty use specific methods of computer mediated communication may

assist in developing communications tools better suited to the online teaching and learning process.

Furthermore, ever-expanding access to high-speed Internet connections in the home and workplace improves the technical feasibility of integrating desktop videoconferencing and voice chat into online classrooms. While these technologies increase the communication possibilities between instructor and student, as well as among students, technology development should be guided by an understanding of: (a) who comprises the student population; (b) what limitations are imposed by the realistic, client-side technical capacity of students and faculty to incorporate the technology into the learning process; (c) what motivates student enrollment in online courses, and (d) what elements of the online teaching process facilitate student participation.

If the introduction of desktop videoconferencing requires the instructor and all students to sit at their respective computers at the same time each week, online education may lose its convenience and appeal to some adult students. On the other hand, if videoconferencing is developed and introduced in a manner that easily archives video clips for later review and comment by the instructor and students, then online education may broaden its appeal to those adults whose learning style requires multiple forms of feedback. What is critical is the joint development of these tools by students, educators and technologists to ensure that the technology serves the needs of students and educators.

Program Development

Improving or maintaining a high level of student persistence in an online course or program of study involves much more than technology development and faculty training. There are multiple strategies that can be implemented by institutions which offer online programs to facilitate student persistence. The following section first discusses these individual strategies, then suggests the need for a broad approach to online program development.

First, as mentioned above when addressing faculty development, it is important to know the demographic and situational characteristics of your student population. The development and success of any online program requires an understanding of who will enroll in the program, why they enroll, and what factors may inhibit their participation. If an institution anticipates the needs and challenges faced by students enrolled in their online program, it is better prepared to deliver the services and supports these students may need to succeed in the program.

One strategy for better understanding student needs is to conduct an ongoing evaluation program. As discussed in Chapter I, this study developed as a result of initial course and program assessment activities conducted regularly by the institution participating in the study. These ongoing evaluation activities provided critical information regarding student demographics, student satisfaction, student persistence and student use of communication methods. Since these activities were ongoing for the past several years, the researcher was able to quickly compare persistence rates between the study semester and the previous academic year. Ongoing assessment activities also assist in evaluating the impact of faculty training, new technology, and changes in

administrative policy. These activities can also be used to collect data regarding future program development.

A second strategy for better understanding and meeting student needs is to monitor and review: (a) student matriculation status, and (b) student progress toward degree completion. As discussed earlier in this chapter, students' matriculation into a certificate or program of study was related to their persister status and their intention to take a future online course. The lack of subsequent online courses in a program of study was identified as a reason persisters did not intend to take another online course. Institutions should carefully consider their timelines for the development and offering of online certificates and degrees to ensure that as students progress through a program, subsequent online courses will be available to the students. Additionally, institutions should review their matriculation policy and practice with an eye toward facilitating the online student's matriculation into a program of study.

A number of students indicated that their reason for withdrawing from, or not enrolling in a subsequent, online course was that the course content was not what they expected. Institutions can address this by ensuring that complete and accurate information regarding the course content, syllabus, assignments and timelines is published on a public course website. Many learning management systems support the display of this information to potential students and it is critical in assisting students to select the appropriate course.

Another strategy for setting realistic student expectations is to provide a student orientation prior to enrollment in an online course or program. An orientation can be conducted on campus in a computer lab and/or online. A number of institutions have also

developed pre-course assessments, which students can complete online in order to assess their readiness for participation in an online course. Tools such as a pre-course assessment or online orientation help students to better understand the learning process they are about to embark upon.

As important as knowing and supporting the student body, is knowing the strengths and limitations of the program and institution. The findings above suggest that although the convenience of individual online courses may attract student enrollments, persistence is facilitated through the offering of complete online certificate and degree programs. While the pioneering efforts of individual online faculty have demonstrated the feasibility and popularity of online education, the development and support of complete certificate and degree programs requires a broad institutional effort that includes faculty, staff and administrators. Taken individually, the suggestions discussed above represent techniques an institution may implement to support student persistence in their online program. Taken as a whole, these techniques suggest the need for collaborative planning, development, implementation and support efforts that involve academic departments, faculty development staff, technical support staff, program development units, student service units and administrative leaders. In other words, just as a university community works together to develop, offer and support on-campus certificate and degree programs, so must that university community work together to offer and support online certificate and degree programs.

Future Research

The research findings discussed above and in Chapter IV suggest several areas where additional research is warranted. The findings which established differences between instructor to student interaction and student to student interaction suggests the need for research which asks why this occurs, particularly since many advocates of online education mention the expanded opportunities for student to student interaction and collaboration. Research which closely examines the setting in which instructor and student interaction occurs and asks why there are differences may contribute to a better understanding of these differences.

Two related areas of research might also more closely examine differences in: (a) how instructors and students each use different methods of interaction, and (b) how methods of interaction are used differently by various courses and disciplines. These lines of research could make a significant contribution to the areas of faculty development and online pedagogy. A third, related area of research might examine how different methods of interaction can be used within courses for collaborative work among students. While this study began an examination of how students used each of the three methods of interaction for the sharing of course related materials, the design of the study limited the power of the analysis. An alternative experimental design could potentially control the use of specific methods within courses, allowing a comparison of outcome measures.

The emergence of student attitudes as a predictor of persistence and a correlate of interaction suggests the need to examine more closely the relationship between student attitudes, student achievement and student performance. While previous research

indicates that student attitudes are positively related to persistence and commitment (Kuh & Hu, 2001; Pascarella & Terenzini, 1991; Tinto, 1987), the relationship between student attitudes, student achievement and student performance in online education has not yet been examined. Research in this area would help to move beyond the "No Significant Difference" discussion so thoughtfully summarized by Thomas Russell (1999).

Finally, this study was conducted primarily with adult students enrolled in a continuing education program. As discussed earlier, these students typically have multiple commitments that sometimes interfere with their motivation or ability to complete a course or program of study. Additional research, which examines the relationship between interaction, student attitudes and persistence among traditional 18 – 22 year old students in online programs, may assist in better understanding the application of this educational technology among the traditional, on-campus, undergraduate population.

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APPENDIX A

LETTER INVITING INSTRUCTOR PARTICIPATION

Email to Instructor requesting participation of class in study

(Sent to instructors on November 21, 2001)

Dear Prof. Smith,

I am writing you to request your assistance in completing a research study on the issue of student and faculty interaction in online education. As a doctoral candidate at the at the University of XXX, I am conducting research on the relationship between interaction in online courses and student retention. As an online instructor in the program, you understand the importance of quality interaction and communication between you and your students. The purpose of this research project is to better define the types of interaction which occur in online education and to better understand the relationship between interaction and student retention. Your willingness to allow your class to participate in this research will help facilitate this understanding which may in turn benefit your students and this institution.

The actual involvement of your students will be limited to the completion of an anonymous, online survey during the last two weeks of the semester and participation in a telephone interview for a sample of students who do not complete this online course. Students will have an opportunity to decline completing the survey but will also have an opportunity to enter a raffle to win one of ten $25 gift certificates for the Barnes & Noble bookstore if they submit a survey. Additional data on student retention within your course will be collected via the Student Information System and I will also review a subset of course communications in 10% of our courses to confirm the accuracy of student reported survey data. These activities will not require any additional effort on the part of you or your students.

The participation of your class in this study is completely voluntary. None of the information collected for this study will be used for faculty evaluation or future hiring decisions. All course names and numbers will be coded to allow anonymous review of evaluation and retention data. Student survey responses will be submitted anonymously, with course code numbers only. Again, your participation in this study is completely voluntary.

The participation of you and your students is critical to supporting research on quality and interaction in online education. I ask that you take a moment to consider my request and then send me back an email indicating whether or not you will participate in this study. It would be helpful if you could respond by Monday, November 26. If you have any additional questions, please email me or phone me at the number below. Thanks for your support of our program.

Sincerely,

Steven Tello

APPENDIX B

LETTER INVITING PERSISTER PARTICIPATION

First Email to Students Requesting Participation in Study

(Sent to students week of December 2, 2001)

Dear Online Student,

I am writing to request your assistance in completing a research study on the issue of student and faculty interaction in online education. As a doctoral student at the the University of XXX, I am conducting research on the relationship between interaction in online education and student retention. As an online student in the program, you understand the importance of quality interaction and communication between you and your instructor. The purpose of this research project is to better define the types of interaction which occur in an online course and to better understand the relationship between interaction and student retention. Your willingness to complete an online survey will assist me in conducting this research and will help facilitate a better understanding of how to provide a quality online learning experience for all students. Your instructor has already consented to participation in this study, however your participation is entirely voluntary.

Your actual involvement in this study will be limited to the completion of an anonymous, online survey which will be available when you log into your course website on Monday, Dec. 3 through Friday, Dec. 14. When you log into your course through the "My Student Login" you will be presented with the option of taking the survey for each participating course, taking the survey later or declining participation in the survey. I estimate it will take approximately 15 minutes to complete the survey. As an added incentive inviting your particip who win a gift certificate will be contacted by email once the survey period has ended. Once you complete a survey for each participating course, you will no longer be presented with the survey request screen.

Your participation in the survey is voluntary and all responses will be submitted anonymously. I want to assure you that absolutely no information identifying your responses will be collected or shared with faculty, fellow students or administrators. Data will be reported well after the period to submit grades has ended and will only be shared in a cumulative class format. Individual student responses will not be reported. I hope you will consider my request and consent to participate in this study. The participation of you and your classmates is critical to supporting research on quality and interaction in online education. Thanks for your assistance,

Steven Tello

Second Email to Students Requesting Participation in Study

(Sent to students week of December 9, 2001)

To: Fall 2001 Online Students
From: Steven Tello
Re: Online Survey

I am writing to remind those of you who have not yet completed the online course survey that it will remain online through next Friday, Dec. 14. This provides you with an opportunity to complete the survey over the weekend or after your course's final exam. I also want to remind you that we are awarding a $25 Barnes & Noble gift certificate to ten randomly selected students who complete the online survey. Five students have already been notified that they were randomly selected to receive a gift certificate this week. We will select the remaining five recipients at the end of the workday on Dec. 14.

I would like to thank each of you who have taken the time to complete the online survey presented when you log into your online courses. Your feedback regarding your online course experience is critical to this research project and to maintaining a high quality online program. We have received approximately a 30% response rate to date and hope to double this to 60% by next Friday. The survey can be accessed when logging into your course through the "My Student Login" button and entering your course username and password.

As mentioned in previous communications, your participation is voluntary and all survey data is submitted anonymously. If you have additional questions or comments, please contact me at Steven_Tello@uml.edu or by phone at 978-934-4240.

Thanks again for your support and participation.

Third Email to Students Requesting Participation in Study

(Sent to students week of December 16, 2001)

To: Fall 2001 Online Students
From: Steven Tello, Associate Director
Re: Online Survey & Evaluation

As you all know, the end of the semester is fast approaching. I would like to take a moment to thank each of you who took the time to complete the online survey. We have received 590 anonymous responses to date, a 53% response rate. Our goal is a 60% response rate, another 120 responses. This will provide a substantial representation of the student experience in our program this past semester. This data will serve as this semester's only online course evaluation and will assist us in the development of future courses and new faculty.

In an effort to meet the 60% mark, we plan to leave the online survey accessible to you throughout this weekend. The survey can be accessed when logging into your course through the My Student Login button and entering your course username and password.

We very much appreciate your feedback and hope you will take a few minutes to complete this survey.

Sincerely,

StevenTello

APPENDIX C

PERSISTER SURVEY INSTRUMENT

PERSISTER SURVEY INSTRUMENT – FALL 2001

Note: If you are taking more than one online course, please submit a complete survey for each course.

Q1. Are you completing this survey for the course listed below? If the course listed is not correct, please return to the previous screen and select the correct course from the list.

[Researcher's Note: The online survey will automatically display the course and course number the student is enrolled in, based on the link the students select when first logging into their courses. If it is incorrect, students can return to the previous screen to select the correct course name and number. Course name and number will not be submitted with the completed survey, instead a course code number will be entered into the survey database.]
[Course Name and Number will appear]

Q2. Are you enrolled in a UMass Lowell Degree or Certificate Program?
0 = Missing
1 = Yes
2 = No (Please skip to Item 5)

Q3. If enrolled in a degree or certificate program, will you complete the program this semester or do you need to take additional courses in future semesters?
0 = Missing
1 = I will complete the program this semester.
2 = I need to take additional courses in the future.
9 = skip

Q4. If enrolled in a degree or certificate program, are you completing this program entirely online?
0 = Missing
1 = Yes
2 = No
9 = skip

Q5. How many total courses (online & on-campus) did you take this semester?
0 = Missing 5 = 5
1 = 1 6 = 6
2 = 2 7 = 7
3 = 3 8 = >7
4 = 4

When answering the following questions, please specify if you strongly disagree, disagree, agree or strongly agree:

Q6. This course contributed to my knowledge regarding the subject matter:
0 = Missing
1 = Strongly Disagree
2 = Disagree
3 = Agree
4 = Strongly Agree

Q7. The instructor provided feedback regarding my homework and other course assignments in a timely manner:
0 = Missing
1 = Strongly Disagree
2 = Disagree
3 = Agree
4 = Strongly Agree

Q8. The instructor's feedback helped me to succeed in this course:
0 = Missing
1 = Strongly Disagree
2 = Disagree
3 = Agree
4 = Strongly Agree

Q9. The amount of communication with my instructor was appropriate for this course:
0 = Missing
1 = Strongly Disagree
2 = Disagree
3 = Agree
4 = Strongly Agree

Q10. The amount of communication with my classmates was appropriate for this course:
0 = Missing
1 = Strongly Disagree
2 = Disagree
3 = Agree
4 = Strongly Agree

Q11. This course met my expectations:
0 = Missing
1 = Strongly Disagree
2 = Disagree
3 = Agree
4 = Strongly Agree

Q12. I would recommend this course to another student:
0 = Missing
1 = Strongly Disagree
2 = Disagree
3 = Agree
4 = Strongly Agree

Q13. Do you intend to take another online course next semester?
0 = Missing
1 = Yes
2 = No

Q13B. Why? Why Not?
[TEXT BOX]

Course Communications
The following questions address your experience using the various communications tools within your online course. These tools include online chat, online discussion forum and email. Please answer these questions referring to the course you identified in Item #1.

Q14. How often did you use the communications tools noted above to discuss course related matters with your instructor?
0 = Missing
1 = Never
2 = Less than once per week
3 = About once per week
4 = Several times per week
5 = Nearly every day

Q15. How often did you use the communications tools noted above to discuss course related matters with your classmates?
0 = Missing
1 = Never
2 = Less than once per week
3 = About once per week
4 = Several times per week
5 = Nearly every day

Online Chat Sessions

Chat sessions are real-time exchanges, typically scheduled once per week by your instructor in the online course chat room.

Q16. How often did your instructor use online chat to discuss course related topics?
0 = Missing
1 = Never
2 = Less than once per week
3 = About once per week
4 = Several times per week
5 = Nearly every day

Q17. How often did you attend this class' online chat session?
0 = Missing
1 = Never
2 = Less than once per week
3 = About once per week
4 = Several times per week
5 = Nearly every day
If you selected never, please skip to item #21

Q18. On average, how many minutes per week did you spend in each online chat session you attended?
0 = Missing
1 = Less than 15 minutes
2 = 16 to 30 minutes
3 = 31 to 60 minutes
4 = More than 60 minutes
9 = Skip

Q19A. Did you use online chat to share course related resources and materials with your classmates (e.g., online links, attachments, presentations, written assignments)?
0 = Missing
1 = Yes
2 = No
9 = Skip

Q19B. If yes, please describe how you used chat to share resources:
[TEXT BOX]

Q20. Overall, would you say weekly chat sessions contributed to your online learning experience?
0 = Missing
1 = Strongly Disagree
2 = Disagree
3 = Agree
4 = Strongly Agree
9 = Skip

Online Discussion Forum

The online Discussion Forum provides a space where you, your classmates, and instructor can post comments and questions any time of the day in a non-realtime format. The Discussion Forum is considered asynchronous compared to the Chat Room which is real time and synchronous.

Q21. How often did your instructor use the online Discussion Forum to discuss course related topics?
0 = Missing
1 = Never
2 = Less than once per week
3 = About once per week
4 = Several times per week
5 = Nearly every day

Q22. How often did you access the online Discussion Forum in your class?
0 = Missing
1 = Never
2 = Less than once per week
3 = About once per week
4 = Several times per week
5 = Nearly every day

If you selected "Never" please skip to item #26.

Q23. On average, how many minutes per week did you spend reading materials in, or posting contributions to the online Discussion Forum in your class?
0 = Missing
1 = Less than 15 minutes
2 = 16 to 30 minutes
3 = 31 to 60 minutes
4 = More than 60 minutes
9 = Skip

Q24A. Did you use the online Discussion Forum to share course related resources and materials (e.g., online links, attachments, presentations, written assignments) with classmates?
0 = Missing
1 = Yes
2 = No
9 = Skip

Q24B. If yes, please describe how you used the online Discussion Forum to share resources:
[TEXT BOX]

Q25. The online Discussion forum contributed to your overall online learning experience?
0 = Missing
1 = Strongly Disagree
2 = Disagree
3 = Agree
4 = Strongly Agree
9 = Skip

Class Email Lists
Class Email Lists allow you, your classmates and your instructor to send one email message to one, all or a selection of your classmates.

Q26. How often did your instructor send messages regarding course related topics using the Class Email list function in your online class?
0 = Missing
1 = Never
2 = Less than once per week
3 = About once per week
4 = Several times per week
5 = Nearly every day

Q27. How often did you send messages using the Class Email list function in your online class?
0 = Missing
1 = Never
2 = Less than once per week
3 = About once per week
4 = Several times per week
5 = Nearly every day
If you selected "Never" please skip to item #31.

Q28. On average, how many minutes per week did you spend reading email from students or the instructor in your online course?
0 = Missing
1 = Less than 15 minutes
2 = 16 to 30 minutes
3 = 31 to 60 minutes
4 = More than 60 minutes
9 = Skip

Q29A. Did you use the Class Email list to share course related resources and materials (e.g., online links, attachments, presentations, written assignments) with classmates?
0 = Missing
1 = Yes
2 = No
9 = Skip

Q29B. If yes, please describe how you used the online Class Email list to share resources:
[TEXT BOX]

Q30. The Class Email list function contributed to your overall online learning experience?
0 = Missing
1 = Strongly Disagree
2 = Disagree
3 = Agree
4 = Strongly Agree

Demographic Information
Q31. Age Group
0 = Missing
1 = 18-24
2 = 25-34
3 = 35-44
4 = 45-54
5 = 55-64
6 = 65 or older

Q32. Gender
0 = Missing
1 = Male
2 = Female

Q33. Do you have children under the age of 18 living in your home?
0 = Missing
1 = Yes
2 = No

Q34. During this past semester, how many hours per week did you spend working on a job for pay?
0 = Missing
1 = 0 hours
2 = 1-10 hours
3 = 11-20 hours
4 = 21-30 hours
5 = 31-40 hours
6 = More than 40 hours

Q35. Please select the item below which you consider your primary adult role:
0 = Missing
1 = Student
2 = Parent
3 = Working Professional
4 = Other ----------

Q36. Please indicate the number of years you have used the Internet:
0 = Missing
1 = Less than one year
2 = 1-3 years
3 = More than three years

Q37. How many hours per week did you spend engaged in course related activities? (e.g., reading lectures, reading texts, researching, homework, chat)
0 = Missing
1 = Less than three hours
2 = 3-6 hours
3 = 7-9 hours
4 = More than nine hours

Q38. The course website was accessible when I attempted to view course material:
0 = Missing
1 = Strongly Disagree
2 = Disagree
3 = Agree
4 = Strongly Agree

APPENDIX D

NON-PERSISTER SURVEY INSTRUMENT

NON-PERSISTER SURVEY INSTRUMENT - FALL 2001

1. Would you mind spending 10 minutes on the phone with me now to complete this survey?

Proceeded with Interview = 1
Will Complete Mail Survey = 2
Declined Interview = 3
Requested Call Back: = 4

2. Our records indicate that you were enrolled in an online course at the University during this past Fall semester, is this accurate?

Yes = 1
Not Enrolled in Online Course = 2

3. First, I would like to confirm the course you were enrolled in. The name of the course is *COURSE NAME*, **is this correct?**

Yes = 1
No = 2

4. Our records indicate that you *ENROLLMENT STATUS* **from this course. Is this correct?**

Correct = 1
Incorrect - Formally Withdrew = 2
Incorrect - Received Incomplete = 3
Incorrect - Received Pass/No Pass = 4
Incorrect - Received Failing Grade = 5
Incorrect - Other (Please list below) = 6

5. Are you enrolled in a UMass Lowell Degree or Certificate Program at this time?

Yes = 1
No (proceed to Q8) = 2

6. Will you complete the program this semester or do you need to take additional courses in future semesters?

I will complete the program this semester. = 1
I need to take additional courses in the future. = 2

7. Are you completing this program entirely online?

Yes = 1
No = 2

8. How many total courses (online & on-campus) did you take this semester?

1 = 1
2 = 2
3 = 3
4 = 4
5 = 5
>5 = 6

9. Before withdrawing from your online course, how many hours per week did you spend engaged in course related activities such as reading lectures, reading text books, researching, homework, chat, etc.

0 hours = 1
1 - 3 hours = 2
3 - 6 hours = 3
7 - 9 hours = 4
More than nine hours per course = 5

10. Did you expect to spend this amount of time on your course, more time on your course, or less time on your course?

Expected to Spend Less Time = 1
Expected to Spend Same Time = 2
Expected to Spend More Time = 3
Chose No Answer = 4

11. When you enrolled in this course, what was your primary reason for selecting this course?

The course was required in my program	= 1
The course was an elective in my program	= 2
The course would help me in my current job	= 3
The course would help me secure a promotion at work	= 4
The course topic sounded interesting	= 5
The course would give me chance to meet people online	= 6
Or another reason?	= 7

12. From the list I'm about to read, what was the primary reason you did not complete this course? Was it due to:

Family Commitments	= 1
Work Commitments	= 2
You learned what you needed to know before completing the course	= 3
The course content was not what you had expected	= 4
The contact with your instructor was not what you had expected	= 5
The contact with your classmates was not what you had expected	= 6
You experienced technical difficulties while accessing course materials	= 7
Or another reason?	= 8

13. From the same list is there a secondary reason you did not complete this course?
I will repeat the list of responses for you.

Family Commitments	= 1
Work Commitments	= 2
You learned what you needed to know before completing the course	= 3
The course content was not what you had expected	= 4
The contact with your instructor was not what you had expected	= 5
The contact with your classmates was not what you had expected	= 6
You experienced technical difficulties while accessing course materials	= 7
Or another reason?	= 8

14. This course contributed to my knowledge regarding the subject matter:

Strongly Disagree	= 1
Disagree	= 2
Agree	= 3
Strongly Agree	= 4

Chose No Answer = 5

15. The instructor provided feedback regarding my homework and other course assignments in a timely manner:

Strongly Disagree = 1
Disagree = 2
Agree = 3
Strongly Agree = 4
Chose No Answer = 5

16. The instructor's feedback helped me to succeed in this course:

Strongly Disagree = 1
Disagree = 2
Agree = 3
Strongly Agree = 4
Chose No Answer = 5

17. The amount of communication with my instructor was appropriate for this course:

Strongly Disagree = 1
Disagree = 2
Agree = 3
Strongly Agree = 4
Chose No Answer = 5

18. The amount of communication with my classmates was appropriate for this course:

Strongly Disagree = 1
Disagree = 2
Agree = 3
Strongly Agree = 4
Chose No Answer = 5

19. This course met my expectations:

Strongly Disagree = 1
Disagree = 2
Agree = 3
Strongly Agree = 4

Chose No Answer = 5

20. I would recommend this course to another student:

Strongly Disagree = 1
Disagree = 2
Agree = 3
Strongly Agree = 4
Chose No Answer = 5

21. Do you intend to take another online course next semester?

Yes = 1
No = 2

22. How often did you use the communications tools noted above to discuss course related matters with your instructor?

Never = 1
Less than once per week = 2
About once per week = 3
Several times per week = 4
Nearly every day = 5

23. How often did you use the communications tools noted above to discuss course related matters with your classmates?

Never = 1
Less than once per week = 2
About once per week = 3
Several times per week = 4
Nearly every day = 5

24. How often did you attend this class' online chat session?

Never = 1
Less than once per week = 2
About once per week = 3
Several times per week = 4
Nearly every day = 5

25. On average, how many minutes did you spend in each online chat session you attended?

Less than 15 minutes	= 1
16 to 30 minutes	= 2
31 to 60 minutes	= 3
More than 60 minutes	= 4

26. How often did you access the online Discussion Forum in your class?

Never	= 1
Less than once per week	= 2
About once per week	= 3
Several times per week	= 4
Nearly every day	= 5

27. On average, how many minutes per week did you spend reading materials in, or posting contributions to the online Discussion Forum in your class?

Less than 15 minutes	= 1
16 to 30 minutes	= 2
31 to 60 minutes	= 3
More than 60 minutes	= 4

28. How often did your instructor send messages regarding course related topics using the Class Email list function in your online class?

Never	= 1
Less than once per week	= 2
About once per week	= 3
Several times per week	= 4
Nearly every day	= 5

29. How often did you send messages using the Class Email list function in your online class?

Never	= 1
Less than once per week	= 2
About once per week	= 3
Several times per week	= 4

Nearly every day = 5

30. On average, how many minutes per week did you spend reading email from students or the instructor in your online course?

Less than 15 minutes = 1
16 to 30 minutes = 2
31 to 60 minutes = 3
More than 60 minutes = 4

31. Which of the following age groups apply to your current age?

18-24 = 1
25-34 = 2
35-44 = 3
45-54 = 4
55-64 = 5
65 or older = 6

32. Are you male or female?

Male = 1
Female = 2

33. Do you have children under the age of 18 living in your home?

Yes = 1
No = 2

34. During this past semester, how many hours per week did you spend working on a job for pay?

0 hours = 1
1 - 10 hours = 2
11 - 20 hours = 3
21 - 30 hours = 4
31 - 40 hours = 5
More than 40 hours = 6

35. Which of the following categories best describes what you consider your primary adult role:

Student	= 1
Parent	= 2
Working Professional	= 3
Other	= 4

36. Please indicate the number of years you have used the Internet:

Less than one year	= 1
1 - 3 years	= 2
More than three years	= 3

37. This completes the questions on this survey. Are there any additional comments you would like to add?

Thank you very much for taking the time to complete this survey.

APPENDIX E

METHOD OF INTERACTION INDEX SCORES BY COURSE

Per Course Method of Interaction Index Scores

Course ID	Chat Index	Discussion Index	Email Index
742	3.00	13.29	5.86
743	9.22	12.38	7.11
744	7.50	11.90	6.67
746	10.57	11.43	7.57
748	8.25	11.25	7.75
750	9.35	10.40	7.25
752	9.24	11.11	7.41
753	8.73	9.90	5.36
755	8.75	8.00	7.00
757	9.20	11.50	5.40
759	9.08	11.46	6.07
761	9.67	10.00	8.44
763	7.69	11.50	8.15
765	8.75	10.67	5.00
768	10.08	8.23	6.85
769	7.36	5.77	8.29
774	7.79	9.86	5.64
778	8.85	9.00	7.36
780	9.38	9.43	7.48
781	8.59	9.24	7.24
782	9.47	8.53	5.93
784	8.16	9.84	6.47
785	7.23	9.15	6.08
786	9.60	4.83	5.57
787	8.38	7.38	7.46
788	9.71	6.50	6.27
789	9.23	6.62	6.36
792	9.75	7.63	6.25
793	7.60	8.29	5.77
795	7.64	9.36	7.64
797	7.21	6.62	5.43
800	3.27	4.75	5.75
801	3.53	8.37	7.11
802	9.21	9.07	7.14
805	7.27	10.09	7.91
806	6.29	6.46	6.73
807	8.08	6.42	7.75
808	7.71	9.00	7.15

(Continued)

Course ID	Chat Index	Discussion Index	Email Index
809	8.24	10.12	7.24
810	8.56	8.93	7.13
813	8.86	7.71	7.86
815	9.00	7.19	6.81
816	7.56	9.88	8.78
819	8.50	6.00	5.62
822	6.00	5.86	5.47
823	7.18	8.70	6.83
826	9.11	11.05	8.89
827	7.65	10.80	9.35
830	6.70	8.55	7.09
831	4.17	7.58	6.83
876	9.10	10.40	7.10
878	9.25	9.86	5.38

APPENDIX F

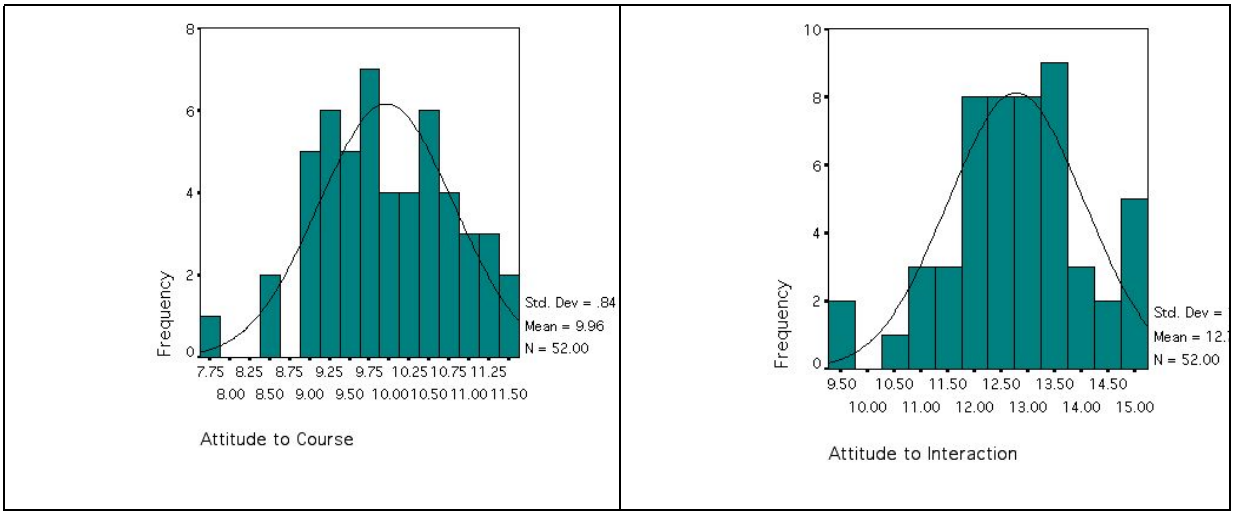
DESCRIPTIVE STATISTICS AND DISTRIBUTION OF ATTITUDE INDEXES

Descriptive Statistics and Distribution Data for Attitude Indexes

		Attitude to Course	Attitude to Interaction
Mean		9.96	12.78
Std. Error of Mean		.12	.18
Median		9.91	12.77
Std. Deviation		.84	1.28
Variance		.71	1.63
Minimum		7.70	9.43
Maximum		11.55	15.19
Percentiles	25	9.30	12.10
	50	9.91	12.77
	75	10.59	13.51

N = 52

Histograms Depicting Distribution of Per Course Responses



APPENDIX G

LETTERS INVITING NON-PERSISTER PARTICIPATION

First Letter Inviting Non-Persister Participation with Consent Form

(Sent to students week of January 6, 2002)

Dear <<Student Name>>,

I am writing to request your assistance in completing a research study on the issue of student and faculty interaction in online education. The University's records indicate that you were enrolled in an online course during this past fall semester (Fall 2001) and that you did not complete this course. As a doctoral student at the University of XXX, I am conducting research on the relationship between interaction in online education and student retention. The purpose of this research project is to identify the reasons students do not complete online courses. Your willingness to complete a 15-minute telephone interview will assist in conducting this research and will help facilitate a better understanding of how to provide a quality online learning experience for all students.

Your former instructor has already consented to participation in this study, however your participation in this study is entirely voluntary. If you agree to participate in a telephone interview your responses will be entered anonymously into our survey database by the research assistant who conducts the telephone interview. Absolutely no information identifying who submitted a survey will be shared with faculty, fellow students or administrators. Data will be reported in a cumulative class format and individual student responses will not be reported.

Attached to this letter is a Consent to Participate form and a stamped, pre-addressed envelope. This form offers you the opportunity to agree to participate in the telephone interview or to decline participation. If you consent to participate, please sign the form indicating your consent to participate and return in the enclosed pre-addressed envelope. It would also be helpful if you would indicate the best time of day to call and a phone number you can be reached at. The research assistant will contact you shortly after we receive your consent to participate. If you decline participation, the researcher will not contact you, however I request that you still return the form in the enclosed envelope. If you do not return the enclosed form, you will not be contacted to participate in the telephone interview.

Enclosed with this letter, you will also find $2.00. This is enclosed as a token of appreciation for taking the time to consider this request, and hopefully, consent to participate in the survey. I would like to thank you for considering my request to participate in the telephone survey. Your participation is critical in supporting research on quality in online education. If you would like to contact me directly I can be reached at 978-934-4240.

Sincerely,
Steven Tello
Associate Director of Distance Learning

Consent to Participate in Telephone Survey

Research Study: "An Analysis of the Relationship Between Instructional Interaction and Student Persistence in Online Education."
Researcher: Steven F. Tello
Date: January 10, 2002
<<Student Name>>
<<Fall 2001 Course>>

You are being asked to participate in a 15 minute telephone survey to discuss your experience with online education at the University of XXX during the Fall 2001 semester. The purpose of this survey is to identify the reasons students do not complete online courses.

If you consent to participate, you will be telephoned by the research assistant, who will then conduct the survey. If you decline to participate, the researcher will not contact you, however I request that you still return the form in the enclosed envelope. If you do not return the enclosed form, you will not be contacted to participate in the telephone interview.

Your participation is entirely voluntary and all responses will be entered anonymously into the survey database. Absolutely no information identifying who submitted a survey will be shared with faculty, fellow students or administrators. Data will be reported in a cumulative class format and individual student responses will not be reported. Your participation in this survey will in no way impact your course work or relationship with the University.

If you have questions regarding this request or any aspect of the research, you can contact the researcher, Steven F. Tello, at the following address/telephone number:

_____ I agree to participate in a telephone survey regarding my experience with online education during the Fall 2001 semester.

The best time to telephone me is:

My phone number is:

_____ I decline to participate in a telephone survey regarding my experience with online education during the Fall 2001 semester.

_____ I was not enrolled in the above course.

Research Participant's Signature

Second Letter Inviting Non-Persister Participation

(Sent to students week of January 27, 2002)

Dear <<Student Name>>,

Earlier this month your were sent a letter requesting your consent to participate in a telephone interview regarding your decision to withdraw from an online course at the University of XXX during the Fall 2001 semester. I am writing to you a second time to check that you did in fact receive this letter and to offer you a second opportunity to participate in this survey. The purpose of this survey is to identify the reasons students do not complete online courses. Your willingness to complete a brief 15-minute survey will assist us in conducting this research and will help facilitate a better understanding of how to provide a quality online learning experience for all students.

If you are still interested in completing the telephone survey, please return the attached Consent to Participate form in the enclosed envelope. However, we now have another option for completion of the survey. Several students suggested that a written survey which they could complete and return independently would be more convenient than trying to schedule a phone interview with my research assistant. For this reason, I have enclosed a paper copy of the survey along with a pre-addressed, stamped envelope. Your comments on your online course experience and your reasons for withdrawing from your online course would greatly benefit this research study. I am making a particular effort to contact students who withdrew from an online course because these students are typically not included in satisfaction and retention studies. Your comments, both positive and negative, would be greatly appreciated.

As mentioned in the earlier mailing, your participation in this research study is entirely voluntary. Your survey responses will be entered anonymously into our research database so any comments or feedback you provide will not in any way impact your enrollment in courses or programs at the university. If you decide not to complete the survey, I ask that you check “No” on Item 1 and return the survey in the enclosed stamped envelope. This will assist us in tracking the student response rate.

I would like to thank you for considering my request and hope you will complete and return the attached survey. Your participation is critical in supporting research on quality in online education. If you would like to contact me directly I can be reached at 978-934-4240.

Sincerely,

Steven Tello
Associate Director of Distance Learning

Third Letter Inviting Non-Persister Participation

(Sent to students week of February 17 , 2002)

Dear <<Student Name>>,

Several weeks ago you were sent a letter requesting your participation in a survey regarding your decision to withdraw from an online course at the University of XXX during the Fall 2001 semester. I am writing to you to confirm that you did receive this letter and to offer you a final opportunity to participate in this survey. We have received 33 anonymous responses to date, a 31% response rate. In order to complete this study, we need to reach a 60% response rate, another 30 responses. This rate will provide a substantial representation of the 105 students who withdrew from an online course during the Fall 2001 semester.

Enclosed you will find an additional paper copy of the survey along with a pre-addressed, stamped envelope. Your comments on your online course experience and your reasons for withdrawing from your online course would greatly benefit this research study. Your comments, both positive and negative, are very much appreciated.

As mentioned in the earlier mailing, your participation in this research study is entirely voluntary. Your survey responses will be entered anonymously into our research database so any comments or feedback you provide will not in any way impact your enrollment in courses or programs at the university. If you decide not to complete the survey, I ask that you check "No" on Item 1, complete the demographic questions on page 5 (Questions 30 – 35) and return the survey in the enclosed stamped envelope. This will assist us in tracking the student response rate.

I would like to thank you for considering this last request and hope you will complete and return the attached survey. Your participation is critical in supporting research on quality in online education. If you would like to contact me directly I can be reached at 978-934-4240.

Sincerely,

Steven Tello
Associate Director of Distance Learning

APPENDIX H

PRETEST SURVEY ADMINISTRATION

A pretest administration of the research survey was conducted during the Fall 2000 semester. The online survey was administered to a convenience sample of four online courses. The researcher contacted instructors for four online courses oeach of the courses via email, explained the purpose of the research and pretest and asked their permission to contact students in their respective courses. Each instructor granted permission for his or her class to participate.

Of the 106 students asked to participate in the pretest, 67 survey responses were received, resulting in a response rate of 63%. The response rate reported for the pretest did not entail the use of any incentives beyond two reminder emails. Table 29 indicates which survey questions are related to which measurement objectives in this pretest survey.

Table 29

Pretest Survey Measurement Objectives

Objectives	Corresponding Questions
type of course interactions (synchronous, asynchronous) (reader, responder)	16,17,17B, 19,22,23, 23B, 25,28,29,29B, 31
frequency of course interactions (daily, weekly, monthly)	14,15,20,21,26,27
overall satisfaction with course*	6,13, 38, 39
satisfaction with the course content*	12
satisfaction with instruction*	7,9
satisfaction with course materials*	10,11
satisfaction with course interaction*	8,18,24,30
satisfaction with technical aspects of course*	37
demographic information (age, sex, experience, program)	1,2,3,4,5,32,33,34,35,36

* Satisfaction data collected for Division of Continuing Studies Quality Assurance activities, not for this study.

Frequency of interaction and method of interaction were measured by a selection of twelve questions that ask students to indicate the type of interactions in which they engage within their online course and six questions that ask students to indicate the frequency and duration of these interactions. Frequency of interaction responses included none, less than once per week, once per week and more than once per week. Duration of interaction included less than 15 minutes, 16 to 30 minutes, 31 to 60 minutes, more than 60 minutes.

A review of the data collected for these responses allowed the researcher to categorize courses according to differences in the frequency and method of interaction. This pretest dataset indicated differences between courses regarding the method and frequency of interaction. For example, the pretest dataset indicated that students in Course A (67%) and Course C (70%) were more likely than students in Course B (44%) to use synchronous chat at least once per week. Students in Course C (77%) and Course B (81%) were more than twice as likely as students in Course A (33%) to use the asynchronous discussion forum at least once per week. These pretest findings suggest that the survey data approach is an appropriate method for identifying differences in the frequency and method of instructional interaction between online courses.

Student satisfaction was measured by a selection of 14 questions in the pretest survey. These data were collected as part of the Division of Continuing Studies ongoing quality assurance activities. While not specifically under study in the proposed research project, a review of the completed satisfaction items in the pretest survey suggested several modifications to the original survey. The distribution of data collected through the satisfaction items was skewed to the strongly agree and agree responses. The skewed

data collected in the pretest limited the statistical analysis that could be conducted during the pretest. In an attempt to improve the distribution of student responses, the following changes were made: (a) reduced the number of satisfaction items on the survey; (b) rephrased some satisfaction items to focus more closely on aspects of communication and interaction, (c) introduced an incentive for students who complete the survey in an effort to increase the response rate, (d) expanded the sample size to collect a more representative sample.

The pretest survey included an open-ended question regarding the respondents' experience completing the survey. Thirty-four respondents posted entries to this item. A content review of these 1-2 line responses indicated that 21 respondents stated the survey was a positive experience indicating that the survey was easy to complete or easy to understand. Ten respondents identified an issue with the survey. Issues identified by these 10 respondents included: (a) yes/no selections were not consistent, (b) students unclear as to which class they were submitting a survey for, (c) students needed more space to elaborate on degree status, (d) no indifferent choice provided (a conscious effort on the part of this researcher).

Overall, subjects responding to this item indicated the survey was easy to use and appropriately designed, however the Yes/No placement and course selection items had to be improved. These changes were incorporated into the proposed survey. Additional changes to the survey based on the pretest survey responses included content and technical changes. The "intent to persist" and several interaction questions were revised to clearly focus responses on the independent and dependent variables. Multiple interaction questions were used to assist in categorizing and measuring the frequency

and method of interaction. Technical modifications included the implementation of a database flag to eliminate multiple submissions and to track non-respondents as well as providing respondents with a review of course selection prior to submission of the completed survey.

APPENDIX I

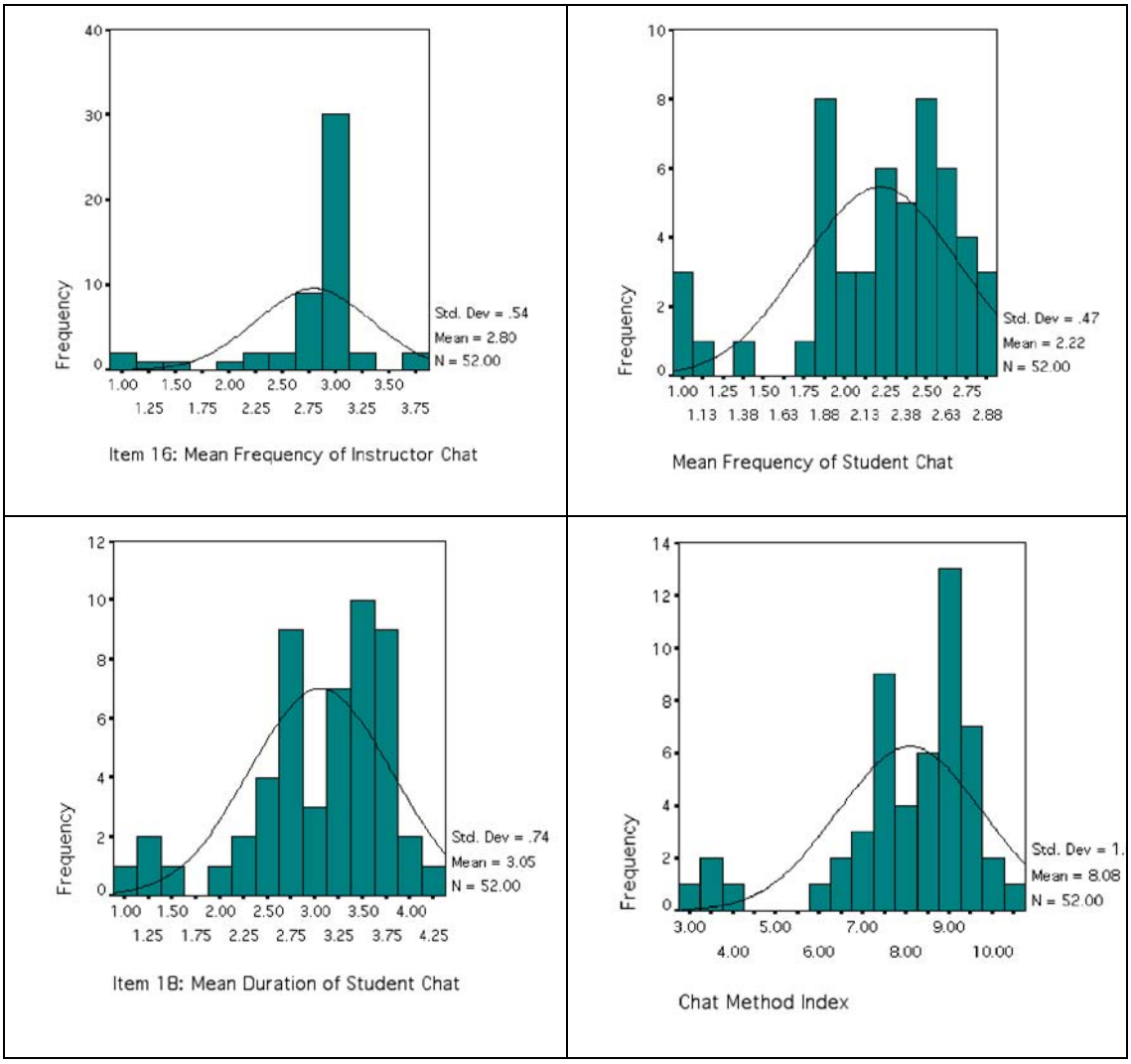
DESCRIPTIVE STATISTICS AND DATA DISTRIBUTION FOR THREE METHODS OF INTERACTION

Descriptive Statistics and Distribution Data for Method of Interaction by Chat

		Item 16	Item 17	Item 18	Chat Method Index
Mean		2.80	2.22	3.05	8.08
Std. Error		0.08	0.07	0.10	0.23
Median		2.97	2.32	3.23	8.53
Std. Deviation		0.54	0.47	0.74	1.66
Variance		0.29	0.22	0.55	2.75
Minimum		1.00	1.00	1.00	3.00
Maximum		3.71	2.88	4.31	10.57
Percentiles	25	2.79	1.93	2.67	7.51
	50	2.97	2.32	3.23	8.53
	75	3.00	2.56	3.61	9.22

N = 52

Histograms Depicting Distribution of Per Course Responses

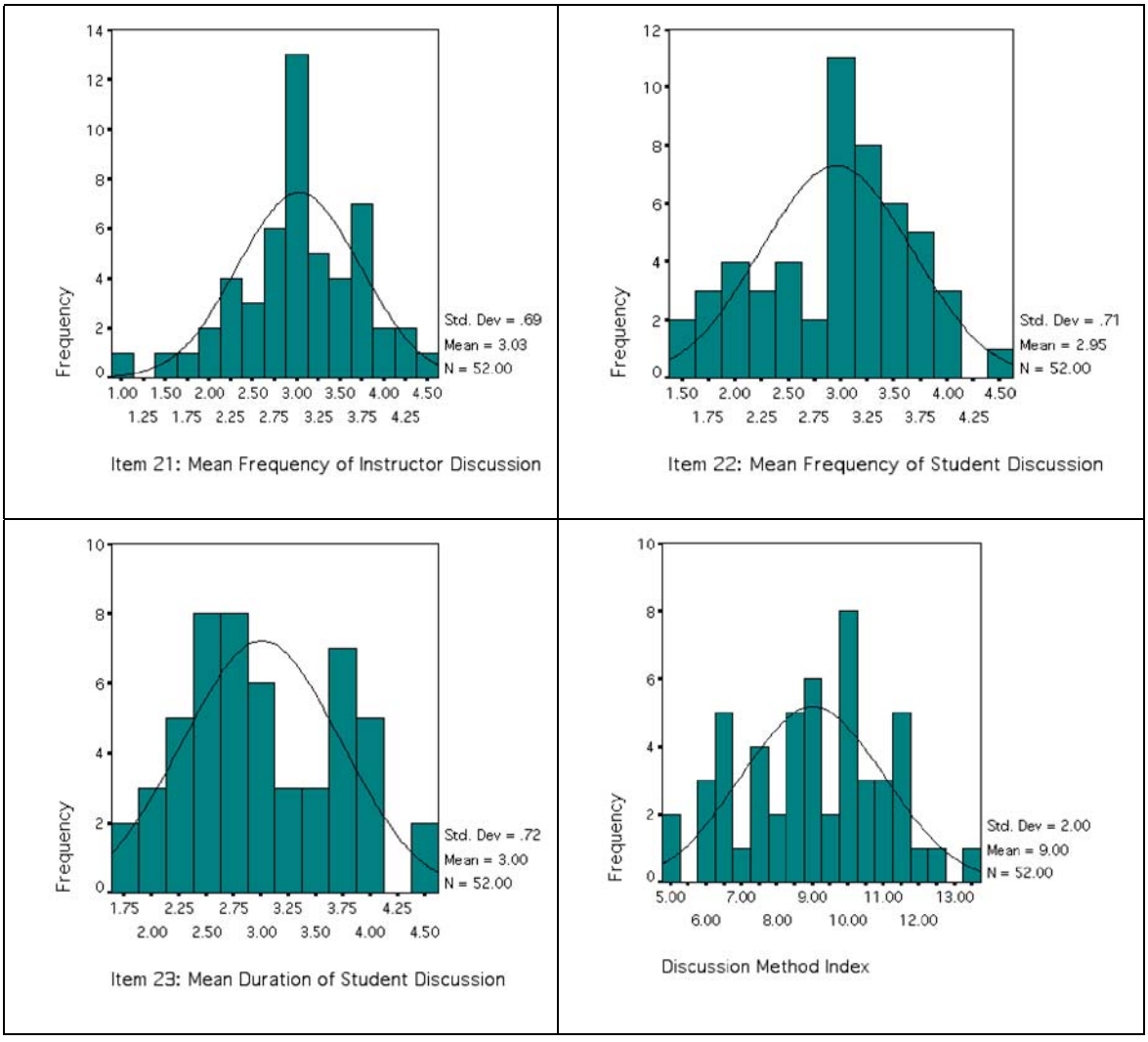


Descriptive Statistics and Distribution Data for Method of Interaction by Discussion

		Item 21	Item 22	Item 23	Discussion Method Index
Mean		3.03	2.95	3.00	9.00
Std. Error		0.10	0.10	0.10	0.28
Median		3.00	3.00	2.89	9.11
Std. Deviation		0.69	0.71	0.72	2.00
Variance		0.48	0.50	0.52	4.00
Minimum		1.00	1.50	1.67	4.75
Maximum		4.43	4.43	4.43	13.29
Percentiles	25	2.66	2.47	2.43	7.59
	50	3.00	3.00	2.89	9.11
	75	3.58	3.49	3.74	10.40

N = 52

Histograms Depicting Distribution of Per Course Responses

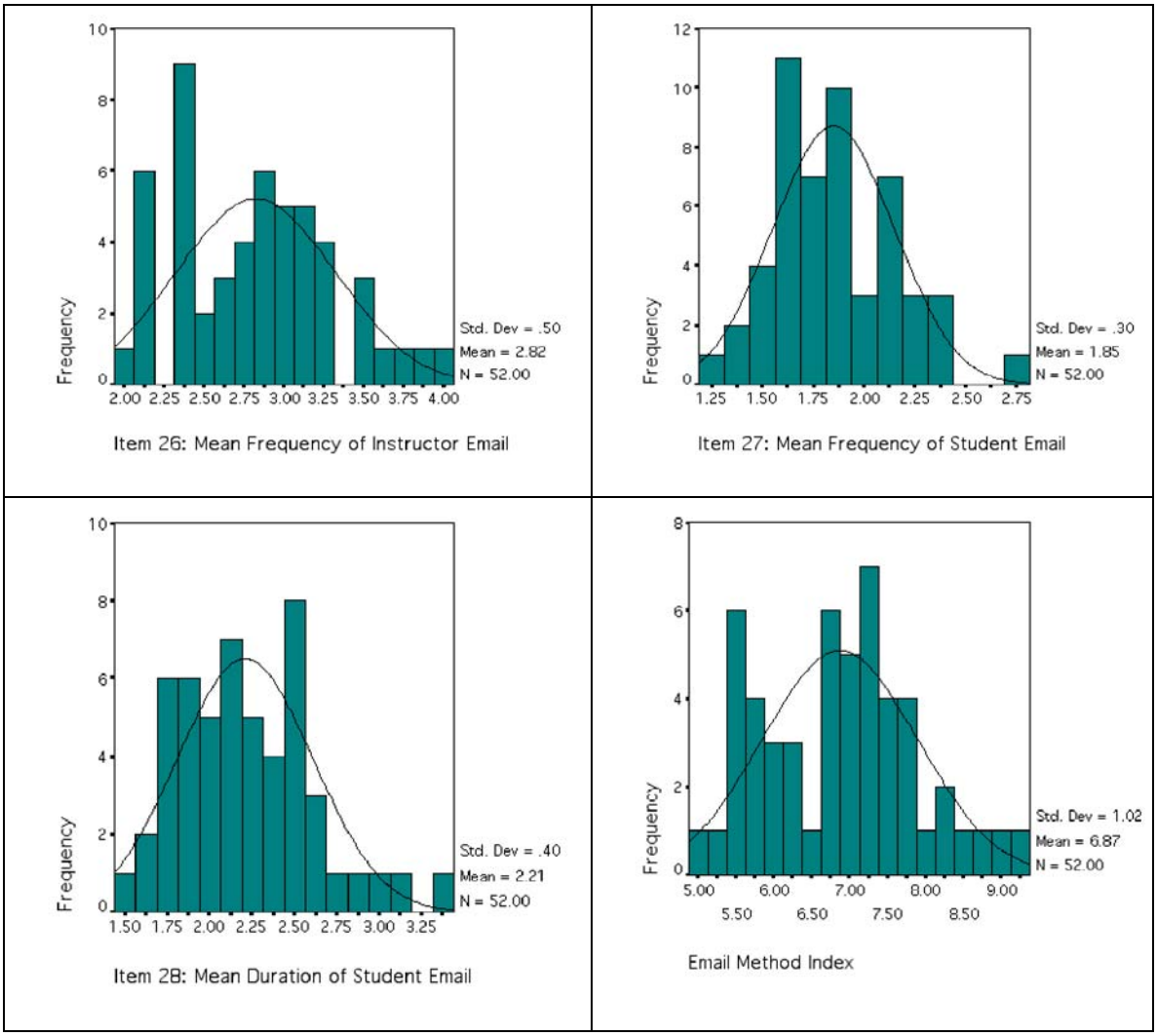


Descriptive Statistics and Distribution Data for Method of Interaction by Email

		Item 26	Item 27	Item 28	Email Method Index
Mean		2.82	1.85	2.21	6.87
Std. Error		0.07	0.04	0.06	0.14
Median		2.84	1.83	2.16	7.05
Std. Deviation		0.50	0.30	0.40	1.02
Variance		0.25	0.09	0.16	1.03
Minimum		2.00	1.27	1.46	5.00
Maximum		4.00	2.70	3.35	9.35
Percentiles	25	2.38	1.63	1.86	5.96
	50	2.84	1.83	2.16	7.05
	75	3.14	2.09	2.49	7.47

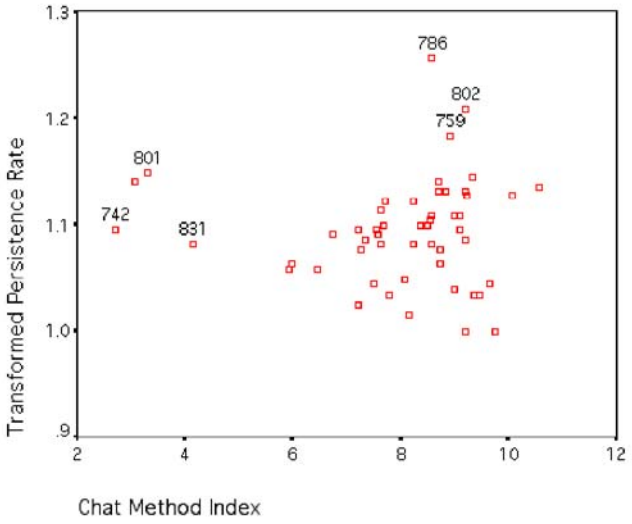
N = 52

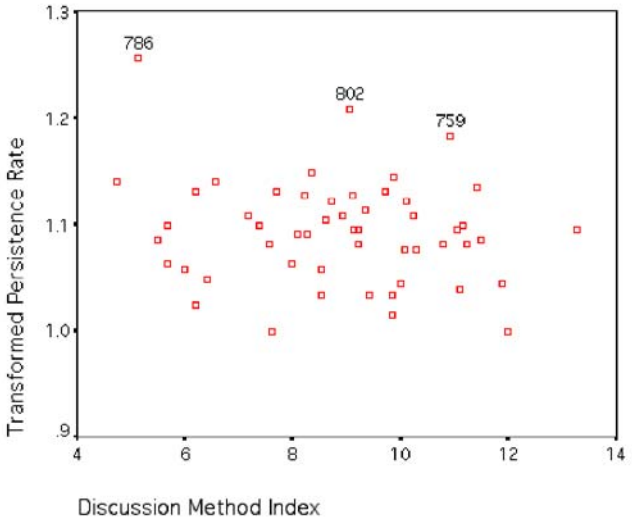
Histograms Depicting Distribution of Per Course Responses

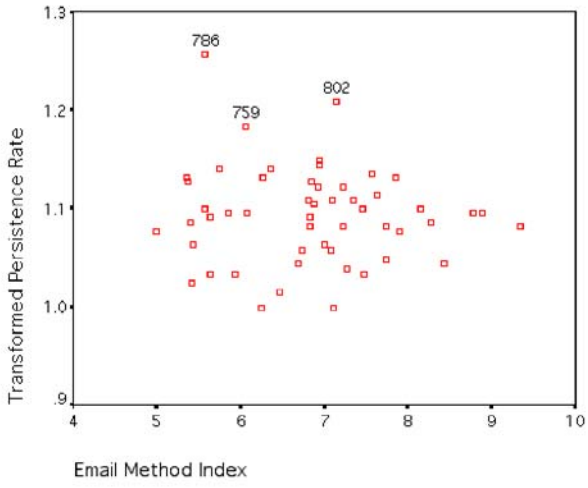


APPENDIX J

TRANSFORMED PERSISTENCE RATE BY METHOD OF INTERACTION INDEX SCATTERPLOTS


Transformed Persistence Rate
Chat Method Index
786
802
759
801
742
831


Transformed Persistence Rate
Discussion Method Index
786
802
759


Transformed Persistence Rate
Email Method Index
786
802
759

BIOGRAPHICAL SKETCH OF AUTHOR

Steven F. Tello received his Doctorate of Education in Leadership in Schooling from the Graduate School of Education, University of Massachusetts Lowell in 2002. Prior to this he earned a Masters of Education in Management and Administration from Cambridge College in 1989, and a Bachelor of Arts in Sociology in 1976 from the University of Lowell. As Associate Director of Distance Education in the Division of Continuing Studies and Corporate Education at the University of Massachusetts Lowell, Mr. Tello oversees the operation and development of the campus's online program, which he started in June 1996.

Mr. Tello has extensive experience in the development and delivery of technology-enhanced training and education for both college and K-12 faculty. Mr. Tello has taught as an adjunct faculty member in the University's Multimedia Certificate Program and has conducted numerous workshops and trainings on the use of multimedia, the Internet and the World Wide Web as a teaching tool. Most recently, he initiated the development of the University's Online Teaching Institute, which provides higher education faculty with an orientation to online pedagogy. Professional affiliations include the University Continuing Education Association, Association for the Advancement of Computers in Education, and the Association for Supervision and Curriculum Development.