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A Model of Freshman Use of Microcomputers Related to Intellectual and Social Development

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A MODEL OF FRESHMAN USE OF MICROCOMPUTERS RELATED TO INTELLECTUAL AND SOCIAL DEVELOPMENT

by

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ABSTRACT

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by

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Utah State University, 1999

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The purpose of this study was to determine the relationship between freshmen's use of microcomputers and their social and intellectual development in a university environment. A review of related literature describes the theoretical foundation of this research and identifies questionnaire items for measuring the critical variables of microcomputer use and student development. To conduct the study, data obtained from 400 freshman students prior to entering Utah State University (USU) in the fall of 1996 were compared to data collected from the same students during Spring Quarter of 1997. Correlational analysis was used to study changes in freshman students' use of microcomputers and variables known to predict students' social and academic integration into the institution. Regression analyses were used to identify variables and dimensions of microcomputer use that contributed to and detracted from students' intellectual and social development.

(268 pages)

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This doctoral dissertation is dedicated to the memory of my father, Robert L. Judd, Jr., for his love, excellent business knowledge, and ideal of family happiness.

Daniel R. Judd

CONTENTS

Page

LIST OF TABLES

Table Page

Table Page

Table Page

Table Page

Table | Page

LIST OF FIGURES

Figure Page

CHAPTER I

PROBLEM STATEMENT

Introduction

As educational computer use evolves, researchers will need to alter their approach to address the demands of microcomputer-related research in education. Studies conducted over the past 15 years have largely focused on defining and describing variables that affect adoption of computer technology or computer literacy (Boettner, 1991; Demetrulias, 1985; Dologite, Ryan, & Ferns, 1990-91; Duncan, 1990; Gabriel, 1985a, 1985b; Geissler & Horridge, 1993; Kagan & Pietron, 1987; Khan & Jessup, 1991; Loyd & Gressard, 1984; Marcoulides & Xiang-Bo, 1990; Martinez & Mead, 1988; Von Holzen, 1993). However, researchers must now focus on the relationship between microcomputer technology and educational goals and values (Ehrmann, 1991; Kay, 1989, 1992a, 1992b,1993a, 1993-94). Kay (1992a) observed that "ultimately educators will have to focus not on how to use computers, but on how to apply computers to educational goals" (p. 446). The first change needed is research into how the use of microcomputers relates to known predictors of student development within the college environment (see Ehrmann, 1995). Ehrmann advised that "what matters most are educational strategies for using technology, strategies that can influence the students' total course of study" (p. 24). Second, researchers need to focus on microcomputer use as a measurable behavior, rather than focusing on the changing concept of computer literacy. Computer literacy measurements have too often in the past relied on a definition of computer literacy arrived at through an internal consensus of educators (see Dologite et al., 1990-91; Duncan, 1990; Von

Holzen, 1993) or external experts (see Gabriel, 1985a; Martinez & Mead, 1988; Simonson, Maurer, Montag-Torardi, & Whitaker, 1987). This has led to what Thompson, Higgins, and Howell (1991) referred to as the "the framework of the month" for examining the impact of technology.

A shift to behavioral measures facilitates the third necessary change--application of a theoretically based methodology for research into microcomputer use. As the field has progressed, a number of researchers (e.g., Davis, 1989; Kay, 1993b; Robey, 1979; Thompson et al., 1991) have supported the observations of Keen (1980) that to be productive, investigation into microcomputer use needs to be based on a "cumulative tradition" that builds upon the research and theory of psychology and other disciplines. Theoretical models that have been used in computer-related research (e.g., Bandura, Azjen and Fishbein, Tinto, and Triandis) were examined in the review of the literature.

The fourth change that is needed is in the scope of research. Researchers who have assessed microcomputer use in higher education have consistently looked at microcomputer use within a single university course (Boettner, 1991; Dologite et al., 1990-91; Duncan, 1990; Hilton, LaBonty, Bartholome, & Stocker, 1993; Kagan & Pietron, 1987; Khan & Jessup, 1991; Lee, Pliskin, & Kahn, 1994; Szajana, 1994). A review of the literature (see Appendix A) yielded only a handful of studies that sampled a larger student population (i.e., Anderson & McClard, 1993; Gabriel, 1985b; Geissler & Horridge, 1993; Martinez & Mead, 1988), yet issues requiring assessment of microcomputer use are no longer confined to a single course or even to a single department, but are institutional in scope (Resmer, Mingle, & Oblinger, 1995).

An extensive review of the literature, however, found no theoretically based studies linking uses of microcomputers with specific factors representing students'

overall development. It is incumbent, therefore, that a theory-based study utilizing a more comprehensive student population be conducted to investigate the relationship between various dimensions of students' use of microcomputers and their social and intellectual development while attending a university.

Statement of the Problem

Utah State University's mission statement begins with this commitment: "Students are the focus as they seek intellectual, personal, and cultural development" (USU, 1996). The effectiveness of microcomputer technology as a resource can be assessed against this statement. Use of microcomputer technology in higher education warrants assessment because of its explosive growth over the past decade (Green, 1996; Green & Gilbert, 1995; Snyder & Hoffman, 1995). While students' use of microcomputers at USU has been studied in the past (see Hilton et al., 1993, Lutz & Hilton, 1990-91; Sanderson, 1992), research describing the effect of microcomputer use on student development delineated in the mission statement was not available. Because of the cost of obtaining and supporting microcomputer technology at USU and other institutions[1] (Blumenstyk, 1994; Green, 1995) research is needed on how students' use of microcomputers relates to the educational goal of student development (Ehrmann, 1995). Currently, the possible benefits of microcomputer use may not be fully realized. Research linking microcomputer use to factors that are known and proven predictors of students' social and intellectual development would

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[1] The Gartner Group, a respected consultancy, calculated that a "PC costs more than $13,000 a year when maintenance, training, and time lost by users is included." This splits as 21% hard equipment, 27% in technical support, 9% administration, and 43% in lost cost opportunity (Weighing the Case for the Network Computer, 1997).

provide a knowledge base for maximizing time and money in this era of tight educational budgets.

Purpose

The purpose of the research is to explore how recognized dimensions of students' microcomputer use (i.e., computer self-efficacy [Compeau & Higgins, 1995], microcomputer skills [Furst-Bowe et al., 1995-96], and frequency of microcomputer use [Davis, 1989; Thompson et al., 1991]) relate to factors predictive of student development (i.e., social and academic integration [Pascarella & Terenzini, 1980], satisfaction, and involvement [Astin, 1993]). The model for this study is built upon the hypothesis that microcomputer use has a positive relationship with freshman social and intellectual development during their first year attending USU.

Research Objectives and Questions

Objectives for accomplishing the purpose of this study are: (a) to determine the extent of freshman students' use of microcomputers prior to their becoming full-time students participating on the USU campus; (b) to obtain measures of freshman students' social and intellectual development while attending USU; (c) to examine changes occurring in freshman use of microcomputers while attending USU; and (d) to determine how freshman use of microcomputers relates to their development.

The research questions to be answered by this study are as follows.

1. Breadth of Use--What types of microcomputer skills do freshmen at USU report being able to perform, and how many different skills do freshmen perform on microcomputers?

2. Frequency of Use--How often do USU freshmen use microcomputers, and when they use microcomputers, how long does a session last?

3. Depth of Use--How confident are USU freshmen about learning new microcomputer software?

4. Change in Use--How does microcomputer use change the first year that students attend USU?

5. Social Development--To what degree do freshman attending USU experience social development and how satisfied are they with social development.

6. Intellectual Development--What do the indicators of intellectual development tell us about the experience of freshmen at USU and how satisfied are they with their intellectual development?

7. Use and Social Development–What relationship exists between microcomputer use and freshman social development?

8. Use and Intellectual Development–What relationship exists between microcomputer use and freshman intellectual development?

Importance of This Study

This research is potentially valuable as an institutional evaluation of the educational uses of technology. Hopefully it is most valuable to the target institution (Utah State University); however, the methodology and results of this study may be valuable for other institutions. The study is expected to assist educators and administrators with (a) decisions about microcomputer technologies taught in the college classroom, (b) institutional or departmental strategies for enhancing student learning through access to information resources, and (c) budget decisions requiring

information about the value of specific microcomputer uses (Ehrmann, 1995; Green & Gilbert, 1995).

Results from this study provide the following information on freshman use of microcomputers which is valuable for developing educational strategies incorporating technology in a university setting.

1. Clarification of the relationship between dimensions of microcomputer use and student development in the context of various input, environmental, and output variables (e.g., demographics, time involvement, goal satisfaction, and so forth).

2. Identification of the specific variables that are most closely related to grade point average (GPA) as the conventional measures of student performance.

3. Identification of the specific computer-related variables that are positively or negatively related to freshman social and intellectual development.

Limitations

Even though student development theorists widely accept an age limitation when describing student populations, it is also recognized that including only the traditional-aged student limits the universal applicability of student development theories and models (Pascarella & Terenzini, 1991). Some theorists are critical of existing student development theory and research due to the number of nontraditional students currently attending college (Dannefer, 1984; Feldman, 1972) and expected to attend in the future.[2] This limitation on applicability applies to this research. The limitation of student development theory to the traditional undergraduate student points to a need

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[2] The Annenberg/CPB project "New Pathways" develops educational materials for the nontraditional student. According to the project's web site (http://www.learner.org/contents), "if current trends continue, this new majority will reach 60% of all enrollments by the year 2000" (acpbinfol.html).

for theory and research pertaining to the "new majority" of students who have not followed the traditional path from high school to college. Also, because institutional character and resources are unique, the generalizability of the findings of this study is limited to USU freshmen.

Definition of Terms

Several key terms are defined to assist the reader in clearly understanding this study.

Analysis terminology, borrowed from experimentation in the physical sciences, may be more familiar to the reader; however, this terminology usually implies cause and effect. Inasmuch as this research is inductive and exploratory of a social phenomenon, any implication of causation is avoided. Therefore, instead of searching for causation, the focus in this research is placed on the relationship between phenomena. Following is a list of terms typically used in describing analysis with equivalent terms.

Preassessment: data from fall 1996 collected prior to fall quarter

Postassessment: data collected in spring 1997

Independent variables: predictor variables

Dependent variable: criterion variable

Microcomputer (or personal computer [PC]) use is employing a microcomputer (PC) to meet a perceived need (e.g., problem solving or communication) or enjoyment (e.g., playing games; Davis, Bagozzi, & Warshaw, 1992; Igbaria, 1990). A review of the literature has yielded four dimensions of microcomputer usage for this study: (a) measurement in terms of frequency of use (how often in a week or year a microcomputer was used); (b) intensity, meaning session length or the minutes or

hours that were spent at the machine during an episode of use (Astin, 1993; Igbaria, Schiffman, & Wiekcowski, 1994; Thompson et al., 1991); (c) breadth, meaning the number and types of different activities the operator can perform on the machine (Furst-Bowe et al., 1995-96); and (d) depth or computer confidence, meaning an individual's perceptions of his or her ability to use computers in the accomplishment of a task (Compeau & Higgins, 1995).

Student development is described as a process of affective and cognitive growth fostered by a university environment through a balance of challenge and support (Chickering & Reisser, 1993). According to Chickering and Reisser (1993), students' affective growth is evident in interpersonal competence and students' cognitive growth is evident in intellectual competence. Astin (1993) relied on overall satisfaction as an important measure of affective growth (see also Baker & Schultz, 1992) and academic achievement and critical thinking ability to gauge intellectual development. Cultural development is another dimension of student development; however, it is not dealt with here because it is considered beyond the methodology and scope of this study.

Student satisfaction: Tinto (1993) stated that "generally, the more satisfying those experiences (at the university) are felt to be, the more likely are individuals to persist until degree completion" (p. 50). Student satisfaction is presented as a valid measurement of social development by Astin (1990) and Tinto. Astin (1993) made the following observation about student satisfaction.

> Of all the types of student outcomes that have been studied so far in college impact studies, student satisfaction shows the weakest relation to student input characteristics (those that students bring with them)....Virtually every other type of outcome measure is more strongly correlated with student input characteristics than with environmental characteristics. In other words, student satisfaction seems to be the only type of college outcome that is not heavily dependent on student input characteristics. (pp. 116-117)

Hence, student satisfaction is in this study as a measure of the relationship between the university environment and student development. Satisfaction is defined as the difference between what was expected and what was experienced (Vavra, 1997; Zeithaml, Parasuraman, & Berry, 1990).

CHAPTER II

REVIEW OF THE LITERATURE

Introduction

This review of the literature describes theory and research used to identify and operationalize assessment instruments for the research. From these instruments, questionnaires deemed useful in a preassessment and postassessment of freshmen's use of microcomputers and development before and during the time that they attended USU were identified. The objective of the literature review was to identify variables suited to a study of the problem and formulate these into questionnaires (Sekaran, 1992). To this end, the review begins with the underlying premise that unites student development and microcomputer use. Then, authoritative views critical of the central premise are presented in the second section. The third section presents theoretical foundations for the constructs of microcomputer use and student development. In the last section, theoretical concepts are organized into a research model and variables are selected to operationalize the model.

Premise

The basic premise of this research is that technology in higher education should serve each institution's mission and values (Chickering & Ehrmann, 1998; Gilbert, 1996). The technology under examination is microcomputers. An underlying assumption of this premise is that institutions of higher education espouse a common value that can be used to assess the value of microcomputer technology. Astin (1996) has claimed that the frequent mention of student development in mission statements is evidence that student development is a value common to colleges and universities

(see also Chickering & Reisser, 1993; Gilbert, 1996; Pace, 1986; Pascarella & Terenzini, 1991). A fitting example is USU's mission statement, which begins with this commitment to student development: "Students are the focus as they seek intellectual, personal, and cultural development" (USU, 1996). Indeed, as Chickering and Reisser (1993) asserted, student development is not simply a common value but the unifying value of all higher education, and it "should be the organizing purpose for higher education" (p. 265). With this in mind, the premise of this study is made more specific by saying that microcomputer technology in higher education should serve student development.

Critical Views

Despite the popularity of microcomputer technology in higher learning, even advocates concede the lack of "...after a dozen years into the 'micro' revolution--any real gains in *instructional productivity*" (Green & Gilbert, 1995, p. 10, emphasis added). Muffoletto and Knupfer (1993) introduced their anthology, Computers in Education, by noting that "no long-term supporting empirical or qualitative evidence shows that technology has made schools and teachers more effective or significantly affected the lives of their students" (p. 2). This lack of supportive evidence has led several leading educators to question the commitment that educational institutions are making to computer technology.

Postman (1992, 1995) pointed out that "embedded in every tool is an ideological bias, a predisposition to construct the world as one thing...to value one thing over another" (1992, p. 13). Postman's claim is that computer technology overvalues efficiency: The high price of educating students for increased efficiency is a socially responsible, spiritual, and moral education. Using the automobile as an analogy to

how blind acceptance of a technology can have long-term negative repercussions, Postman advocates a liberal education that includes exploration into how our society is used by computers, rather than how society can use them.

Similar criticisms, centering on the cultural and ecological impact of integrating computers in education, are voiced by Bowers. In his book Educating for an Ecologically Sustainable Culture, Bowers (1995) included computer technology among the "problematic aspects of modern culture that influence the kind of cultural beings that youth will become as adults" (p. 76). Fundamentally, Bowers (1988) believes technology generates a human-centered (anthropocentric) culture and thereby contributes directly to widespread environmental destruction. Bowers warns that promoting the values embedded in computer hardware and software, such as the preeminent value of progress and the unassailable autonomy of the individual, will eventually lead to ecological collapse.

Recently, Stoll (1995) authored a challenge to the technology of the network and its place in education. Stoll voiced concern about the quality of education that occurs when educators value synthetic educational experiences more than the experience students obtain through direct observation: "Most of what comes across the computer screen is a surrogate for [other] experience" (p. 148). Being an astronomer, Stoll criticized web sites that teach astronomy but do not encourage students to take a telescope out to the night sky (Crystal, 1995).

While the preceding commentaries are authoritative, a review of their work reveals that these critics rely more on rhetoric than on research to argue the deleterious effects of widespread use of microcomputer technology in education. Reference lists for Bowers (1995) and Postman (1992) show no primary research from academic journals (e.g., Journal of Research on Computing in Education, Journal of

Educational Computing Research). Stoll (1995) did not include a list of references. Despite the lack of an empirical foundation, these critics' observations are well reasoned and are, therefore, valuable in pointing to the need for more research into how microcomputers affect the social, intellectual, and cultural development of students.

Theoretical Foundations

The objective of this portion of the review is to search out variables that have been used to assess microcomputer use and student development. Ideally, proper selection of variables could provide a replicable methodology.

Microcomputer Use Assessments

In this section of the literature review, studies of microcomputer use are separated into three groups: those accomplished at USU, those accomplished at other universities, and those accomplished in the workplace.

Studies of students and microcomputers accomplished at USU. The target population for this study is first-time freshmen entering USU; therefore, this review begins with studies that sampled undergraduate students from USU and obtained information about their use of microcomputers. While none of the studies sampled freshmen exclusively, three studies merit further discussion.

1. A longitudinal study by Lutz and Hilton (1990-91) collected data from USU students before they entered a computer literacy course. Findings from this study led Lutz and Hilton to make the following suggestions to accommodate the differences between experienced and new learners: use of peer tutoring, labs for newer learners, and modules within the curriculum.

2. A 1992 study by Sanderson into gender differences in microcomputer learning found no statistically significant difference between the achievement of men and women participating in the introductory computer course in either their topic area or their course grades.

3. In a more recent study (Hilton et al., 1993), a team of researchers conducted an empirical study of undergraduate USU students before and after they took a computer literacy course. Preassessment data showed that, regardless of prior experience, students "did not have the basic microcomputing knowledge they need to succeed at the university" (p. 111). The posttest scores showed, however, that the average student performance increased about 30%, a level that was regarded in the range of "passable competence" (p. 111).

Undergraduate studies completed at other universities. This review continues with a categorization of 34 studies, most of which were cited in recent reviews of computer-related research (Arosteguy, 1996; Judd, 1995). These studies are similar in that they were all conducted within a college or university environment and involved undergraduates as subjects.

To select which studies to review, a categorization scheme was developed based on the recommended improvements for microcomputer-related research (see Chapter I: Problem Statement, pp. 1-2). Published works were classified according to (a) researchers' methods for construction of a psychological measure: an *a priori* theory, factor analysis, or empirical considerations. Construction of a measure refers to the logic supporting item selection. Use of an *a priori* theory requires the author of the measure to select items that test a theory and produces more of a deductive measure--moving from theory to data. Construction based on a factor analysis or empirical (practical) needs produces more of an inductive measure--moving from data

to theory (Anastasi, 1988; Fantino & Reynolds, 1975; Light, Singer, & Willet, 1990); (b) inclusion of attitude, knowledge, and/or behavior type questions (Nogami, 1996); and (c) the presence of the terms "computer literacy," "microcomputer use," or "computer achievement" (see Appendix B).

Only research that contained all three recommended improvements were deemed valuable to this review. Previous research that clearly presented a theoretical foundation was given priority. For an understanding of why studies founded in theory were given priority, it is important to note that while a questionnaire could be constructed using any, or all, of the three methods for construction (i.e., *a priori* theory, factor analysis, or empirical considerations), a number of researchers publishing in this field (i.e., Keen, 1980; Paré & Elam, 1995; Thompson et al., 1991) advocate the use of an *a priori* theory method of construction to create for the field of computer-related research what Keen calls a "cumulative tradition." Table 1 summarizes the categorization of studies.

As can be seen in the percent column of Table 1, categories were not mutually exclusive and studies often contained multiple occurrences of the three recommended improvements. Eight studies contained all three; that is, they had a theoretical method of construction, used behavior type questions, and employed terms referring to either computer use or computer achievement. These studies will be reviewed in chronological order.

Hill, Smith, and Mann (1987) established a theoretical foundation for later computer ability research (Compeau & Higgins, 1995; Crable, Brodzinski, Sherer, & Jones, 1994; Davis, 1989; Fann, Lynch, & Murranka, 1988-89; Igbaria et al., 1994; Kay, 1993a, 1993b) by drawing upon the theories of social psychologists Bandura (1982, 1986) and Fishbein and Ajzen (1975; Ajzen, 1988; Ajzen & Fishbein, 1980). In

Table 1

Categorization of 34 Computer-Ability Studies Conducted in Universities

Category	Frequency	Percent
Method of measure construction		
Empirical	26	76%
Factor Analysis	6	18%
Theoretical	11	32%
Type of question		
Attitude	24	71%
Knowledge	17	50%
Behavior	17	50%
Terms appearing in published study		
Computer literacy	17	50%
(Micro)computer use	17	50%
Computer achievement	10	29%

applying these theories to questions of microcomputer use, Hill et al. conducted two studies in separate midwestern universities. The purpose of the first study was to investigate the relation between people's self-efficacy, behavioral intentions, and their decision to use computers. Results of this study showed that computer self-efficacy makes a statistically significant contribution to prediction of behavioral intentions to use computers, and behavioral intentions are statistically significant predictors of respondents' use of computers. The main purpose of the second study that Hill et al. conducted (1987) was to investigate the relation between previous experience using computers, behavioral intentions to use computers, and computer self-efficacy. Findings from this study supported the hypothesis that previous experience with microcomputers is related to computer self-efficacy, but does not predict behavioral

intentions to use or learn about computers. Together these two studies suggest that self-efficacy is a better correlate of microcomputer use than previous experience.

Another study using a theoretical method of construction (Fann et al., 1988-89) was aimed at answering the question, what is the relationship between students' attitudes toward and experiences with microcomputers and their behaviors involving microcomputers? For analysis, respondents were divided into four groups: "high" and "low" computer self-efficacy and "high" and "low" amount of time working with microcomputers. Results showed a statistically significant difference between the "high" and "low" self-efficacy groups in relation to previous experience using a microcomputer. This was interpreted to mean that "those with more computer experience have more positive attitudes toward computers than those with less microcomputer experience" (p. 312).

Koslowsky, Hoffman, and Lazar (1990) measured three variables, (a) attitudes toward computer use, (b) expected perceptions of friends (or parents) of the importance of working hard in a computer course, and (c) the individual's intention to work hard in a computer class. These attitude variables were related to two behavior variables, (a) frequency of lab use and (b) interactive time while in the lab. The main finding of this study was that there was a negative correlation between greater amounts of experience and both behavior measures. This study is not alone in finding a negative correlation between the quantity of students' previous experience and their acceptance of computers (see Boettner, 1991; Larson & Smith, 1994).

A study by Davidson, Savenye, and Orr (1992) investigated the relationship between learning styles identified by Gregorc (1984) and students' performance in the different modules of a computer applications course. Researchers used Gregorc's instrument, the Delineator, to identify four individual learning styles. These learning

styles were then correlated with assessment results from the course. Results showed that only the student learning style that emphasized the ability to think in the abstract and sequentially had a statistically significant positive correlation with student course scores.

Campbell (1992) sought to predict student enrollment in college computer courses by examining correlations with (a) self-perceived proficiency in using computers, (b) causal attributions associated with computer use, and (c) selected attitudes towards computers. "Causal attributions" refer to students' positive or negative emotions associated with their ability, their effort, the perceived difficulty of the task, and their environment (Weiner, 1980, as cited in Campbell, 1992). Results of Campbell's study showed that the most influential variable for prediction of enrollment in computer courses was "students' perceptions of the usefulness of computers in their education and career plans" (p. 63).

Kay (1993a, 1993b) validated a computer attitude measure by surveying 647 preservice teachers attending four universities in the province of Ontario. The purpose of the study was twofold: (a) to explore an alternative computer attitude measure, and (b) to investigate the effect of context on students' self-reported use of computers. Analysis revealed seven distinct factors that Kay reported as cognitive attitudes (student, personal, and general), affective attitude, behavioral attitudes (home and class), and perceived control. Kay's results showed a correlation of $\underline{r} = .71$ between actual ability and perceived control. Ability also correlated with affective attitude ($\underline{r} = .50$) and perceived control also correlated with computer awareness ($\underline{r} = .66$). Kay's interpretation of these correlations was that "if an educator wished to improve attitude toward computers, more emphasis could be placed on awareness and applied skill" (p. 381).

In 1994, Torkzadeh and Koufteros reported their efforts to validate a measure grounded in Bandura (1982). The measure was Murphy, Coover, and Owen's (1989) Computer Self-Efficacy Scale. In a discussion of their results, the researchers emphasized a need to better understand the relationship between educational practices and students' computer self-efficacy in the context of developing their competency with computers.

The final study in this chronology (Furst-Bowe et al., 1995-96) does not emerge from the same theoretical foundation as the other studies, but this final study merits review for its application of Total Quality Management (TQM) to measuring student microcomputer use. This study introduces the idea that microcomputer technology usage in the college setting is fast becoming a dimension of institutional quality, as well as a student performance outcome (Ehrmann, 1991). As Seymour (1996) observed, a new paradigm of institutional quality is emerging that measures excellence in terms of student development, rather than relying on a comparison of resources.

In Furst-Bowe et al. (1995-96), a 10-person TQM team at University of Wisconsin-Stout sought to identify four main objectives: (a) the computer competencies of students at UW-Stout, (b) faculty members' computer competency expectations of students, (c) computer competency expectations of graduates upon entering the work force as viewed by alumni, and (d) computer competencies of graduates upon entering the work force as viewed by employers. Four samples were drawn for the study: students, program directors, alumni, and employers. For the student sample, eight sections of Freshmen English 102 were randomly selected from which 157 responses were collected. Students were asked in the questionnaire if they could perform a task. The three other nonstudent samples were asked if they thought

students needed the skill reflected in the task. From the results, the team identified computer skills that were rated as necessary by 50% or more of at least two of the nonstudent samples (i.e., program directors, alumni, employers). These they molded into a policy of minimum microcomputer competencies for their university:

> Upon graduation, all UW-Stout graduates will be able to perform, at a minimum, the following computer tasks: use operating systems such as MS-DOS and Windows; manage files on hard disk; learn to use a program with the documentation that is provided; generate business letters and research reports; create spreadsheets that include formulas; create, sort, and query databases; charts, graphs, and flowcharts; and send and receive electronic mail. In addition, graduates will possess a variety of computer skills specific to their major academic programs. (p.187)

While no one study carried out in the context of higher education specifically addressed the problem (i.e., the relationship between microcomputer use and student development), the theoretical foundation established by these studies is valuable. In particular, the work of Ajzen (1988) and Ajzen and Fishbein (1980) and the work of Bandura (1982, 1986) in social psychology will be discussed in relation to this study.

Studies of professionals' use of microcomputers. Continuing the search for a replicable study or useful variables, the selection criteria utilized in the previous section (see Table 1) were applied to research conducted within the workplace. The studies that were selected will be reviewed chronologically.

Prior to 1979, studies in the area of microcomputer use did not make reference to the theories of social psychology (Lucas, 1974; Shewe, 1976). Robey (1979) was the first, using expectancy theories of motivation presented by Porter and Lawler (1968), to develop a theoretically based model of user behavior. Robey's findings were summarized in his observation that "use of an information system depends on the user's perception of its impact on his/her performance" (p. 536). Also, he

observed that "the data show a strong relation between concern over goals and the use of MIS (management information system)" (p. 536).

Ten years after Robey (1979), Davis (1989) pursued better measures for predicting and explaining computer use by studying users' perceptions of usefulness and ease of use. To begin, Davis referred to the theoretical arguments of Fishbein and Ajzen (1975) shown to be relevant to computer use research by Robey (1979) and Hill et al. (1987). Davis then developed two separate six-item scales for measuring perceived usefulness and ease of use. Results of two studies showed that users' perceptions of the usefulness of a technology had a stronger correlation with usage than perceptions of the ease of using a technology; in fact, "users are often willing to cope with some difficulty of use in a system that provides critically needed functionality" (p. 333).

Thompson et al. (1991) stressed the need to use "theoretical arguments as a foundation" for research (p. 125). The purpose of their study was to test an alternative theory to Fishbein and Ajzen (1975) in the context of computer utilization. From Triandis (1980), Thompson et al. hypothesized that six factors would positively correlate with an individual's use of a computer: (a) the individual's feelings (affect) toward using computers, (b) social factors in the work place influencing PC use, (c) complexity of microcomputer use, (d) individual's expected long-term consequences of use, (e) job fit with microcomputer use, and (f) facilitating conditions in the environment. These six constructs and microcomputer utilization were operationalized in a 30-item questionnaire that Thompson et al. borrowed and adapted from prior empirical studies (Cheney, Pavri, & Raymond as cited in Thompson et al., 1991). Microcomputer utilization was operationalized on three dimensions, (a) frequency, (b) intensity, and (c) diversity of software packages used. Findings showed that the

variables for social factors in the work place had the greatest effect on microcomputer utilization.

Igbaria et al. (1994) combined a number of variables from other studies to investigate the interrelationship of computer anxiety, fun, usefulness, satisfaction, and microcomputer use. Theoretical grounding for this study was Fishbein and Ajzen's (1975) Theory of Reasoned Action. This theory states that intentions predict behavior. From this theory, these researchers observed that "behavior (usage) is determined by perceived usefulness and perceived fun" (p. 350). Microcomputer usage was measured using four indicators, (a) perceived daily use, (b) perceived frequency of use, (c) the number of software packages used, and (d) the number of business tasks performed on a microcomputer. Results confirmed earlier research and showed that extrinsic motivation is more powerful than intrinsic motivation in determining knowledge workers' use of microcomputers: "Perceived usefulness (extrinsic) is about six times more influential than perceived fun (intrinsic)" (p. 358) in determining microcomputer use.

The assertion arrived at by Thompson et al. (1991) that social factors most influence microcomputer use conflicts with the conclusions arrived at by other researchers (i.e., Davis, 1989; Igbaria et al., 1994; Robey, 1979) who observed that perceived usefulness exerts the greatest influence on microcomputer use. The debate is somewhat resolved by a study that attempted to replicate and extend Thompson et al. Like Thompson et al., Paré and Elam (1995) used the theoretical framework proposed by Triandis (1971, 1980) to identify and understand those factors that favor the use of microcomputers. Contrary to the findings of Thompson et al., however, Paré and Elam showed that perceived usefulness was the dominant

predictor of microcomputer use, "while resource proximity, social norms, and organizational facilitating conditions were somewhat less important" (p. 224).

Finally, a recent effort by Compeau and Higgins (1995) to develop a measure of computer self-efficacy is noteworthy. For their study, computer efficacy was defined as "an individual's perception of his or her ability to use a computer in the accomplishment of a job task" (p. 193). Theoretical foundations draw on Bandura (1982) and resemble previous field studies. However, a review of existing measures of computer self-efficacy (Burkhardt & Brass, 1981; Gist, Schwoerer, & Rosen, 1989; Webster & Martocchio, 1992) led these researchers to conclude that most were measuring "component skills" or "other constructs besides self-efficacy," and that a measure was needed that could serve as an assessment of "the potential to use the software in accomplishment of a task" (p. 193). In concluding, these researchers suggest, "beliefs about outcomes may not be sufficient to influence behavior if individuals doubt their capabilities to successfully use the technologies" (p. 205).

This review of microcomputer-related studies involving professionals in the workplace has presented variables that are, for the most part, similar. Of note, all six studies (Compeau & Higgins, 1995; Davis, 1989; Igbaria, Pavri, & Huff, 1989; Paré & Elam, 1995; Robey, 1979; Thompson et al., 1991) used behavioral measures of microcomputer use with one or more of the dimensions of frequency, breadth, and depth. The summary that follows will draw from the research that has been reviewed in order to operationalize these three dimensions of microcomputer use.

Summary of Microcomputer Use Assessment Studies

In summary, studies using a theoretical method of construction have most often relied upon the theories of social psychologists Fishbein and Ajzen (1975; Ajzen,

1988; Ajzen & Fishbein, 1980) and Bandura (1982, 1986). Research of other social psychologists, Triandis (1971) and Weiner (1980, as cited in Campbell, 1992), have provided the theoretical basis for a few studies and these deserve attention as well. It seems that the use of a theoretical method of construction in microcomputer research seems to be achieving Keen's (1980) ideal of a "cumulative tradition" in the field of microcomputer use research. One stable aspect of this "tradition" appears to be that intentions to use and perceived usefulness of microcomputers are the most influential determinants of acceptance and use of microcomputers (Campbell, 1992; Davis, 1989; Igbaria et al., 1994; Paré & Elam, 1995; Robey, 1979). Applying this conclusion to the study suggests that freshmen at USU will differ in their use of microcomputers according to perceived usefulness in terms of the importance of microcomputer relative to goals and their expected use of microcomputers.

Replicable research or a method for selecting microcomputer-related variables to predict freshman development was not found through a review of the related literature. Therefore, this study adopts an exploratory approach and employs a number of scales measuring microcomputer use employing numerous computer-related variables. The literature review has revealed the general acceptance of four dimensions of microcomputer use: breadth, frequency, intensity, and depth. To adequately measure these dimensions, 143 microcomputer-related variables were included in the two questionnaires. An explanation of variables used to measure each dimension of microcomputer use follows.

Breadth of microcomputer use. Breadth of use was measured by Thompson et al. (1991) and others (Igbaria et al., 1994) with a question such as "Each time you use a microcomputer, how many different software packages do you usually use?" In addition, breadth of use was measured in terms of the variety of skills a person is able

to perform. Using a checklist of particular skills, Furst-Bowe et al. (1995-96) asked to give a self-report of the breadth of their microcomputer use. (A complete listing of all the variables in this study, including all 143 microcomputer-related variables, is presented in Appendix S.)

Frequency of microcomputer use variables. In related research, frequency was measured repeatedly with variations of the question, "How often do you use a microcomputer?" (Davis, 1989; Hill et al., 1987; Igbaria et al., 1990; Koslowsky et al., 1990; Lutz & Hilton, 1990-91; Paré & Elam, 1995; Robey, 1979; Thompson et al., 1991). For this research, a similar question was adapted from Astin's (1990, 1993) studies of student development to measure frequency of use, "How often did you use computers in the last year?" Addressing intentions to use microcomputers, four questions asking freshmen the number of hours per week they expected to use a microcomputer for specific purposes (i.e., for assignments, to play games, or to communicate with family or friends) were adapted from Astin.

For some researchers (Koslowsky et al., 1990; Robey, 1979), the measure of frequency was automated. In a similar manner, this study uses USU lab entry data obtained as all students enter microcomputer labs. Also, intensity was measured in studies as a subscale to frequency (Davis, 1989; Paré & Elam, 1995; Thompson et al., 1991); that is, as the average length of time spent using a computer during a user's sessions with a microcomputer. A question was included in the spring asking freshmen to estimate the length of a typical session at the microcomputer.

Depth of microcomputer use. The findings of Hill et al. (1987), Fann et al. (1988-89), and others suggest that computer self-efficacy increases with experience; therefore, self-efficacy is considered a measure of an individual's depth of microcomputer use. To measure this dimension, the scale developed by Compeau

and Higgins (1995) to measure strength of computer self-efficacy was included in its entirety both fall and spring.

Student Development Assessment

In an extensive review of the student development literature, Pascarella and Terenzini (1991) compared over 2,600 studies conducted on the impact of higher education on student development. In general, they observed that

> two general families (of theories) are discernable in the literature on college students. One addresses the nature, structure, and processes of individual growth....The other focuses less on intra-individual development than on the environmental or sociological origins of student change. These "college impact" models tend to be more eclectic and identify sets of variables that are presumed to exert influence on one or more aspects of student change.... (p. 17)

In that this study is concerned more with the influence of microcomputers on "one or more aspects of student change" than the processes of individual growth, a college impact model best fits with this study. Use of an impact model is also favored because these models assign "a much more prominent and specific role to the context in which the student acts and thinks" (p. 57).

An additional advantage is that there are far fewer theories making up the sociological paradigm of student development. Only four "impact models" are described by Pascarella and Terenzini; of the four, two preceded and served as a foundation for the other two; therefore, only Astin's (1970a, 1970b) and Tinto's (1975, 1987, 1993) models will be reviewed.

Astin's model of student involvement. Astin (1970a, 1970b) constructed one of the earliest college impact models. Known as the Inputs-Environment-Outcomes (I-E-O) model for assessment, input variables measure occurrences prior to freshmen entering the university, output variables are measured at the end of the academic period, and environmental variables are calculated by subtracting scores obtained at

the beginning from those obtained at the end of an academic period. This model is widely accepted in higher education (Pascarella & Terenzini, 1991). The I-E-O model gave rise to Astin's (1984, 1990, 1996) Theory of Involvement, which states that student development occurs in relation to the amount of time and energy that students invest in different activities (e.g., time spent studying, hours per week using a microcomputer, hours per week studying with peers, amount of time spent with faculty outside of class). Astin asserted that measuring involvement factors over time has "shown clearly that the greater the student's degree of involvement in specific known factors, the greater the learning and personal development" (1996, p. 124).

In 1993, Astin published a study that applied the I-E-O model to the question of what matters in college. In this study he reported that the three involvement factors that most directly affected student outcomes were (a) amount of time spent studying alone, (b) amount of time spent studying or doing homework with peers, and (c) amount of time spent interacting with faculty outside of class (chapter 11).

Astin's (1993) study also included measurement of students' use of microcomputers using the variable "time spent using a personal computer." Most useful to this study are Astin's correlations of this computer-related variable with the variable "time spent studying or doing homework," because these show the positive effect of microcomputer use on academic achievement. However, correlations between general outcomes and this variable, "time spent using a personal computer," do not immediately clarify the relation between microcomputer use and students' development (see Appendix C).

Tinto's model of student retention. Tinto (1975, 1987) sought to explain why college students voluntarily drop out or interrupt their education. His model depicts the interaction between students and the academic and social structures of institutions

in a longitudinal model. The premise of Tinto's model is that a student's satisfying encounters with the informal and formal systems of the institution, both academic and social, will lead to greater integration into those systems; then, as a student becomes increasingly integrated into the institutional systems, the likelihood of continuing to completion increases and the possibility of attrition decreases (Pascarella & Terenzini, 1991). A single construct, student development, underlies the model. Student development is defined in Tinto's (1987) model as integration and satisfaction. Integration is the extent to which the student conforms to the attitudes and values of peers and faculty in the institution within both the academic and social structure. Academic integration is the student's academic performance and his or her intellectual development. Social integration is the *quality* of peer-group interactions and the *quality* of student interactions with faculty. Satisfaction, in this case, is a student's perception of goal achievement that he or she has realized in the process of development. Tinto (1987) made it clear that student development is operationalized as involvement: "high levels of involvement prove to be an independent predictor of learning gain," and "the greater students' involvement in the life of the college...the greater their acquisition of knowledge and development skills" (p. 600).

In 1980, Pascarella and Terenzini conducted a study to validate a scale they developed specifically to assess Tinto's (1975) two dimensions of academic and social development. The purpose of the scale was to identify "freshmen who subsequently persist or drop out voluntarily" (p. 71). The study was longitudinal and utilized two questionnaires. One questionnaire was administered the summer prior to enrollment and was designed to assess students' expectations of the college experience and to collect background information. Another questionnaire was administered the following spring and gathered data from students on "the reality of their college experience"

(p. 62). The validity was measured by comparing data from students who voluntarily dropped out with data from those who persisted in their university studies. The results suggest that the factor that made "the largest contribution to group discrimination" was students' expressed commitment to the institution and to their own educational goals. Factors that were important but which contributed less to group discrimination were interactions with faculty and faculty concern for student development and for teaching. Inasmuch as Astin's (1970a, 1970b) and Tinto's (1975, 1987) models of student development form a coherent theoretical basis for evaluating student development,[3] variables from research that validated these models were employed (i.e., Astin, 1993; Pascarella & Terenzini, 1980; Sax, Astin, Korn, & Mahoney, 1995).

Summary of the Literature Review

In the literature review, a replicable study that correlated measures of microcomputer use with measures of student development was not located. Instead, the process of the review led to the identification of numerous variables representing dimensions of microcomputer use and student development. These dimensions can be used to construct an assessment model. Following are definitions for the components forming the model presented in Figure 1.

Dimensions of Microcomputer Use

The three dimensions of microcomputer use identified in the review of the literature and presented in the model are breadth, frequency, and depth. Breadth is

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[3]According to Linda Sax, associate director of the Higher Education Research Institute (HERI) of which Astin is director, Tinto's (1987) theories of student development are fundamental to Astin's model (personal communication, July 3, 1996).

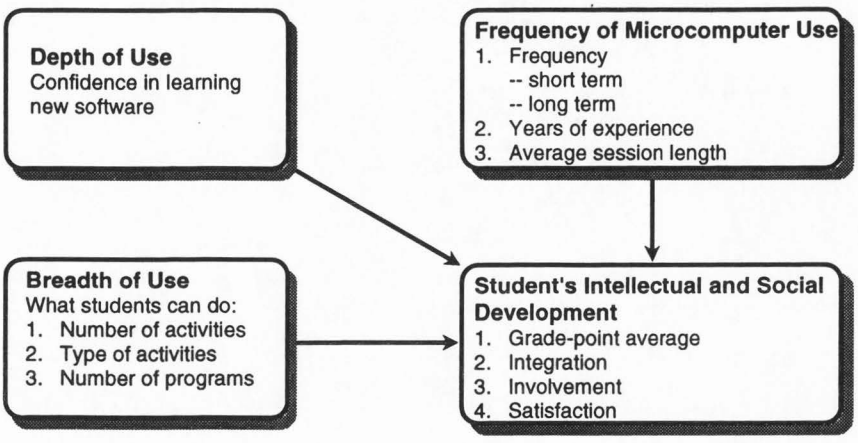

Figure 1. Model to be used in the elaboration of the assessment.

defined as the types and number of microcomputer skills that freshmen reported having (e.g., basic skills, word processing, spreadsheet skills, database skills, etc.) and the number of programs used in a typical computer session; frequency is defined as the general level of use reported during the year prior to entering USU and the number of hours of use during a typical week during the academic year; and depth of microcomputer use is defined as computer self-efficacy and operationalized as computer confidence.

Dimensions of Freshman Development

In addition to dimensions of microcomputer use, the review investigated student development and established that it is a fundamental educational goal for higher education (Astin, 1990; Chickering & Reisser, 1993; Pace, 1986; Pascarella & Terenzini, 1991; USU Mission Statement, 1996). A review of student development focused on the theories of Astin (1970a, 1970b, 1990), Pascarella and Terenzini (1980, 1991), and Tinto (1975, 1987, 1993). (Appendix E lists the variables selected

for the preassessment and postassessment of USU freshmen with a brief rationale for the choice of each item or scale.)

The scale developed by Pascarella and Terenzini (1980) to assess Tinto's (1975) theory of social and intellectual development is central to the model: Five factors of social and intellectual integration operationalize freshman development and are criterion variables in the regression analyses in Chapter IV, Section E of this paper (p. 77). A definition of each factor is presented here to assist the reader in understanding the model in Figure 1.

1. Faculty Interaction is a dimension of social development and measures "contact with the faculty in informal settings outside the classroom" (Tinto, 1993, p. 108).

2. Peer-Group Interaction is a dimension of social development and measures the nature of interactions with other students and subjective impressions of those experiences (Tinto, 1993).

3. Institutional Concern for Student Development is a dimension of social development adapted from Pascarella and Terenzini's (1980) factor Faculty Concern for Teaching and Student Development. It measures students' general impressions of faculty and peer interest in their development.

4. Academic Development is a dimension of intellectual development and measures students satisfactions with their academic performance.

5. Institutional and Goal Commitment is a dimension of intellectual development and measures students' commitment to the institution and to their educational goals. Pascarella and Terenzini's results suggest that this factor made "the largest contribution to group discrimination."

As an additional note to the model in Figure 1, it should be noted that arrows represent the hypothesized relationships between dimensions of microcomputer use and freshman development. It is significant that the arrows point in only one direction--from microcomputer use toward freshman development. This indicates that microcomputer use will have an influence on freshman development, but that the opposite will not occur due to the nature of development.

In concluding this summary of the review of the literature, the reader's attention is directed to the exploratory nature of the study that was developed. Primarily, the study was a response to observations by Kay (1993a, 1993b) and Ehrmann (1995) urging researchers of student use of microcomputers to go beyond simply looking at the use of microcomputers and examine how the technology contributes to the values and mission of education. Secondarily, this study seeks to extend the tradition of theory-based research on microcomputer use in higher education.

CHAPTER III

PROCEDURES

Longitudinal data collected from a sample of entering full-time, first time (FTFT) freshmen were used to investigate how student use of microcomputers relates to intellectual and social development. Table 2 presents a listing of the procedural steps involved in this study.

Table 2

Major Procedural Steps Involved in the Study

Step	Procedure
1	Complete the review of the literature.
2	Select the target population and design the study.
3	Draft the survey instrument.
4	Mail the preassessment questionnaire, cover letter, and return envelope.
5	Administer the preassessment questionnaire to freshmen.
6	Draft the postassessment instrument.
7	In the spring, administer the postassessment to freshmen in the preassessment.
8	Survey nonrespondents.
9	Perform analysis of data.
10	Report results and conclusions.

Population and Sample

The target population for this study is FTFT freshmen entering USU in the fall. Freshmen are sampled because, within the university environment, they are a relatively uncontaminated population with few confounding variables (Astin, 1990;

Pascarella & Terenzini, 1980). A large portion of the sample for this study was taken from a census of students attending the annual freshman orientation seminar held each year on the campus of USU the week prior to the beginning of fall quarter.

Although the use of the freshman orientation seminar as an accessible population frame added considerable ease to the collecting of data, it might have caused sampling bias. Bias from sampling an accessible population is a documented source of external invalidity in research carried out within an educational context (Borg & Gall, 1989; Bracht & Glass, 1968; Kerlinger, 1986; Shaver, 1979; Shaver & Norton, 1980). Shaver and Norton (1980) suggested that the sound generalizability of findings from this study depends on a "knowledge of the attributes of the accessible population as they correspond to those of the target one" (p. 9). Inasmuch as participants in the freshman orientation are known to be distinct from USU's freshman class as a whole, students not attending the freshman orientation seminar were surveyed by mail. USU Computer Services assisted in drawing this sample by providing a random list of approximately 600 freshman students not registered for the orientation seminar. Students not attending the freshman seminar likely were (a) unable to attend because of family or employment commitments, (b) demographically distinct from traditional freshmen, or (c) enrolled off-campus.

While a mailing to freshmen not attending the seminar helped to correct for sampling bias stemming from the use of a convenience sample, data collected via a mailing were also recognized as biased in that freshmen who returned the mailed surveys were self-selected (Borg & Gall, 1989; Dillman, 1978). Therefore, a nonrespondent sampling of the students that did not participate in the preassessment was carried out to test for external validity. As with all of the procedures, suggestions

from the doctoral program committee were solicited for the survey of nonrespondents. Internal validity was less of an issue because the study design was not experimental.

Design

In defining types of research design, Borg and Gall (1989) described this design and strategy: It is correlational in that it is an attempt to "discover or clarify relationships through the use of correlation coefficients" (p. 331). It is a longitudinal survey, specifically a panel study, in that "the investigator selects a sample at the outset of the study and then at each subsequent data-collection point the same individuals are surveyed" (p. 422). The survey was administered as a preassessment of FTFT freshmen prior to the beginning of fall quarter, and then as a post-assessment during spring quarter.

Instrument

Both the pre and postassessment instruments used in obtaining data from the panel of freshmen are contained in Appendix D. Sets of items were selected through the process of the literature review (see Appendix E) and were adapted for a longitudinal design. Appendix E contains sources, descriptions, and a rationale for including each of the sets of questions. Following is a description of the three types of questions included in the questionnaires: microcomputer use, student development, and demographics.

Microcomputer Use

Two studies covered in the literature review supply the majority of items for measuring students' use of microcomputers for the survey: Compeau and Higgins

(1995) and Furst-Bowe et al. (1996). The Computer Self-Efficacy Measure produced by Compeau and Higgins consists of 10 questions. Questions rate respondents strength of confidence on a subscale of 1 to 10, where 1 represents "not at all confident," and 10 represents "totally confident." The researchers tested the reliability of the Computer Self-Efficacy Measure using individual item loading and internal consistency reliabilities. Citing Fornell and Larcker (1981 in Compeau & Higgins, 1995), the authors considered individual item loading and internal consistency reliabilities greater than .70 to be adequate, and concluded that the measure "satisfied the criteria for reliability and discriminant validity" (p. 199).

The measure adapted from Furst-Bowe et al. (1995-96) is a list of activities that can be performed using a microcomputer. For each task, student respondents indicate with a check mark whether they can perform the task. Analysis considered both the number of activities and the types of activities in correlation with student development. Since Furst-Bowe et al. did not report the reliability and the validity of their measure, it was tested as part of this study (see Appendix M).

In addition to these two instruments, other measures of microcomputer use were included. Most notably an adapted version of Astin's (1993) measure of involvement was included which contained three questions to determine how many hours per week freshmen spent using a computer for assignments, for playing games, and for communicating with family and friends. Of the 156 items in the preassessment questionnaire, 73 measured microcomputer use, and of the 171 items in the post-assessment questionnaire, 77 measured microcomputer use. With the aggregation of variables, there were 143 computer-related variables entered into the regression analyses of student development.

Students' Intellectual and Social Development

Measures of student development were selected from the work of Astin (1970a, 1970b, 1979, 1984, 1990, 1993, 1996), Pascarella and Terenzini (1980, 1991), and Calder (1993). A majority of the items that were used to measure students' personal and intellectual development came from three questionnaires: the Student Information Form (SIF), the Student Goal Inventory (SGI), and Pascarella and Terenzini's (1980) measure of social and academic integration.

A review of the reported validity and reliability of each of these measures follows: SIF is the questionnaire used in the Cooperative Institutional Research Program (CIRP), which annually surveys freshmen entering a national sample of approximately 600 accredited postsecondary institutions (see Appendix R for comparison information between institutions). While reliability coefficients were not reported in the 1995 national norms for CIRP (Sax et al.,1995; Sax, Astin, Korn, & Mahoney, 1996), the reliability of items in the SIF is insured by continual revision of the form over its 30-year history and by administration to exceptionally large samples (CIRP annually includes over 200,000 freshman students). For the SGI, Calder (1993) reported that analyzed data from entering freshmen at Georgian College collected "over the six years support the basic stability and reliability of the SGI" (p. 117). Calder used Cronbach's alpha and reported a theta equal to .891 for the inventory. Pascarella and Terrenzini (1980) reported scale alphas ranging from .71 to .84 for the five scales they developed. The predictive validity of their instrument was confirmed by comparing scores to students that actually dropped out of college; scores on the five scales correctly identified 75.8% of the students who later dropped out.

Demographics

Besides standard demographics (i.e., gender, ethnicity, and age), other demographics found to be related to student development and microcomputer use were included in the pre and post questionnaires. Of the 156 items in the preassessment questionnaire, 26 measured student demographics, and of the 171 items in the postassessment, 31 measured student demographics. From both questionnaires, 253 variables measuring microcomputer use, goals, involvement, and demographics were entered in the regression analyses of student development.

Type of Data Collected

In Table F-1 of Appendix F, each item included in the questionnaires is described in terms of the data type, the codes that were used for recording the data for analysis, the research question to be addressed, and the statistical analysis that were used to produce results. This table shows that most of the questions returned either ordinal or nominal data. As can be seen, only a few of the item sets returned interval data, that is, level of confidence and age (Borg & Gall, 1989; Glass & Hopkins, 1984). However, as is common practice, the items returning ordinal data were assumed to be returning interval data for the correlational and regression analysis (Borg & Gall, 1989; Kerlinger, 1986).

The fall 1996 survey of freshman students yielded self-report descriptive data. An example of this type of data is included in Appendix G. The data collected in the fall were compared to data collected in the spring. In addition to self-report data collected in the questionnaires, university databases supplied lab entry data and cumulative GPA. (Approval was obtained from the acting vice president of Student Services to use lab entry data [see Appendix I].)

Analysis

As presented in the introduction, the research questions are

1. Breadth of Use--What types of microcomputer skills do freshmen at USU report being able to perform, and how many different skills do freshmen perform on microcomputers?

2. Frequency of Use--How often do USU freshmen use microcomputers, and when they use microcomputers, how long does a session last?

3. Depth of Use--How confident are USU freshmen about learning new microcomputer software?

4. Change in Use--How does microcomputer use change the first year that students attend USU?

5. Social Development--To what degree do freshman attending USU experience social development and how satisfied are they with their social development?

6. Intellectual Development--What do the indicators of intellectual development tell us about the experience of freshmen at USU and how satisfied are they with their intellectual development?

7. Use and Social Development--What relationship exists between microcomputer use and freshman social development?

8. Use and Intellectual Development--What relationship exists between microcomputer use and freshman social development?

Five of these research questions (numbers 1, 2, 3, 5, and 6) involved descriptive analyses examining relative response frequencies and resulting percentages. Research question 4 required a longitudinal analysis. The summarized statistics from

the first six research question were used in the regression analyses performed for research questions 7 and 8.

Data responses from fall 1996 and spring 1997 questionnaires and from university sources were coded into SPSS Windows (Norušis, 1990) using codes appearing on the questionnaires (see Appendix D). Using SPSS Windows, indicators of development occurring during freshmen's introduction into USU were correlated with reported microcomputer use. Because of the large number of variables obtained from different sources, a factor analysis was performed. Factors identified in the factor analysis together with variables contributing to those factors were used in a multiple regression aimed at describing the magnitude of contribution that microcomputer-related factors and variables made to variation in freshman intellectual and social development (Astin, 1990; Borg & Gall, 1989; Glass & Hopkins, 1984). Astin's (1990) I-E-O model was also applied to variables presented in the regression tables to identify input, output, and environmental variables. Input variables were measured prior to freshman entering USU in fall 1996, outputs were measured during spring 1997, and environmental variables are calculated by subtracting scores obtained fall 1996 from those obtained spring 1997.

CHAPTER IV

FINDINGS

The purpose of this chapter is to report the results of analyses that can be applied to an exploratory model (see Figure 1) relating freshmen student microcomputer use and freshmen's social and intellectual development. In this chapter, results from the study are organized into five sections: (a) analyses of generalizability, (b) descriptive analyses of microcomputer use, (c) longitudinal analyses of changes in microcomputer use, (d) descriptive analyses of freshman development, and (e) regression analyses relating microcomputer use and freshman development. Section A contains a description of the sample and results from surveys of nonrespondents. Section B presents descriptions of the three attributes of microcomputer use (i.e., breadth, frequency, and depth) included in research questions 1, 2, and 3. Section C contains the longitudinal analysis of changes in microcomputer use comparing data collected fall of 1996 and spring of 1997; this addresses research question 4. Section D describes the social and intellectual dimensions of freshman development and contains research questions 5 and 6. In Section E, regression analyses addressing research questions 7 and 8 explore the relationship between predictor variables representing microcomputer use and criterion variables representing freshman development. As depicted in Figure 2, each research question corresponds to a component of the model.

Section A: Analyses of Generalizability

This section covers background and explores the reliability and generalizability of data obtained from the 400 freshmen composing the longitudinal sample. The purpose

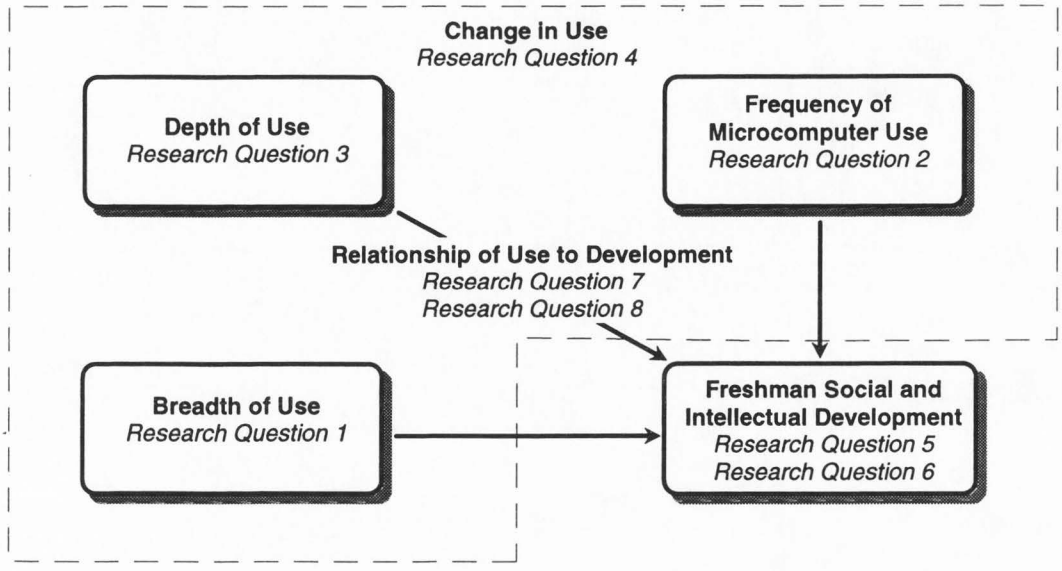

Figure 2. Model relating microcomputer use and student development referencing research questions.

of the analyses of generalizability was twofold. The first was to provide background for the study by describing the population and samples. The second was to determine whether results emerging from later analyses can be generalized.

The external validity of findings and determination of whether the findings from the sample can be generalized to the population were based on statistical and practical significance. Statistically significant differences were defined as having a probability (p-value) less than or equal to .01. This standard for statistical significance was set because the size of the longitudinal sample was relatively large (N = 400) and statistically significant relationships occurred with a low correlation magnitude. Statistically significant differences were, therefore, defined by an alpha level of probability set at $\leq$ 01. Differences of practical significance were defined as a relative percentage difference greater than or equal to 10%.

The generalizability section begins with a brief review of the sampling technique. Next, the sample is described in comparison to various populations and samples. The

section concludes with an examination of the results of several nonresponse bias checks.

Description of the Sampling Technique

The methodology for this study, described in Chapter III, involved acquiring a sample of FTFT USU freshmen from two sources: enrollees in the annual freshman orientation held prior to the beginning of fall quarter (supplied by the Office of Academic Support Services [OASS]), and a randomized list of freshmen not registered for the freshman orientation (supplied by USU Computer Services). From a total of 1,215 fall 1996 responses, paired samples of spring 1997 responses were obtained during spring quarter by surveying lower-division classes (series 100) and by requesting participation from those freshmen who were surveyed the prior fall. The resulting longitudinal sample contained paired responses from 400 FTFT freshmen.

This sampling technique relied on various populations and produced various samples that are compared in this generalizability analysis. To clarify to the reader how these USU freshman populations and samples were interrelated, they are listed here with size, percentage of the appropriate population, and data source for each.

1. Population: fall 1996 all entering freshmen (N = 2,442; 100%; Office of Planning and Analysis [OPA]).

2. Population: fall 1996 FTFT freshmen (N = 1,930; 100%; OPA).

3. Sample: fall 1996 FTFT freshmen (n = 1,215; 63%; OASS).

4. Sample: FTFT students spring 1997 (n = 793; 41%; in-class and e-mail response).

5. Sample: longitudinal sample FTFT freshmen (n = 400; 21%; OASS, in-class, and e-mail response).

Sample Description

The following sample attributes are described in the rest of Section A: gender, attrition, ethnicity, composite ACT score, high school GPA (HSGPA), and residency. These attributes were selected because they were the only attributes available to the author that were common to all samples and either the population of all freshmen or the population of 1996 FTFT freshmen.

Gender comparison. A comparison of gender among the population of 1996 FTFT freshmen, the samples of entering students from fall 1996 and spring 1997, and freshmen in the longitudinal subsample is presented in Table 3. Six *t* tests showed that differences between percentages for the population and the samples were statistically significant ($p \leq .01$) in all cases except for the difference between the spring sample and the longitudinal sample. Also, the percentage difference between the longitudinal sample and the FTFT population was greater than 10% (-24%). Gender, then, gives evidence that the longitudinal sample of entering freshmen was not representative of the population, and that the longitudinal sample more closely resembles the spring 1997 sample than either the fall 1996 sample or the population.

Table 3

Comparison Between 1996 Freshman Student Population and Samples by Gender

Groups	% Female	% Male	*p*-value	% diff.	*n*
Population of 1996 FTFT entering freshmen	59.8	40.2			1,930
Sample of entering freshmen fall '96	63.4	36.4**	.000	-6	1,215
Sample of entering students spring '97	71.2	28.8**	.000	-19	793
Freshmen in longitudinal sample	74.0	26.0**	.000	-24	400

Note. Source was USU Office of Planning and Analysis and OASS self-report data

** Statistically significant difference calculated from *t* test ($p \leq .01$).

Attrition. Attrition in the 1996 freshman class, especially among males, may have contributed to the difference in gender between the samples and the population. Table 4 presents data obtained from USU Computer Services describing the percent attrition at the beginning of each quarter for the freshman orientation sample. Results in Table 4 show that nearly half (46.2%) of 1996 entering freshmen (N = 1,181) were not attending the university a year later. Also, it shows that freshman males interrupted their university attendance at a rate more than twice that of females. In the present study, this attrition rate made it difficult to collect a matched sample in the spring. As observed in the gender comparison, the longitudinal sample may better represent 1996 FTFT freshmen who persisted through spring 1997. (Unfortunately, parameters were not available for the population in spring of 1997 [Kyle Hyde, personal communication, July 17, 1998]).

Table 4

1996 USU Freshman Orientation Attendees Percent Attrition for Academic Year

Academic period	Male (n = 413)	Female (n = 768)	Total attrition (N = 1,181)
Winter quarter 1997	23.5%	9.5%	14.4%
Spring quarter 1997	34.4%	15.8%	22.3%
Fall quarter 1997	71.2%	32.8%	46.2%

Note. Source was USU Computer Services.

Ethnicity. Table 5 compares the ethnicity of the population to the three samples of freshmen. Besides the remarkable ethnic homogeneity of freshmen at USU, results in this table show that the spring and longitudinal samples were slightly more ethnically diverse than the population. Three t tests calculated using the percent White and not

Table 5

Comparison Between 1996 Freshman Population and Samples by Ethnicity

Group	% White/ not Hispanic	p-value	% difference	N
Population of 1996 FTFT freshmen	95.5			1,930
Sample of FTFT freshmen fall 1996	93.4**	.000	3	1,215
Sample of FTFT freshmen spring '97	94.1**	.000	2	793
FTFT freshmen in longitudinal sample	95.0**	.000	1	400

Note. Source for population parameters was the USU Office of Planning and Analysis and OASS self-report data

** Statistically significant difference calculated from t test ($p \leq .01$).

Hispanic and between the spring sample, the population, and the fall sample showed no statistically significant difference ($p \leq .01$), and the percentage differences did not exceed 3%. Therefore, when considering ethnicity, the longitudinal sample appears representative of the population.

Composite ACT. Table 6 presents a comparison between composite ACT scores for the population and the longitudinal sample used for this study (scores were unavailable for the fall and spring samples). Results in this table show that the

Table 6

Comparison of 1996 Freshman Population and Samples by Composite ACT

Groups	M ACT composite	p-value	% difference	SD	n
Population of 1996 entering freshmen	22.3			4.2	1,909
Freshmen in longitudinal sample	24.2**	.000	-9	4.2	390
In-class responses	24.2**	.000	-9	4.3	315
Mailed responses	24.3**	.000	-9	4.1	75

Note. Source for population parameters was the American College Testing Class Profile Freshman Class 1996-97, and for sample statistics; the USU Registration Office through SIS-Plus

** Statistically significant difference calculated from t test ($p \leq .01$).

longitudinal sample has a mean composite ACT score about two points higher than the population of entering FTFT freshmen (n = 1,909; size is smaller than the total population because ACT scores were not available for some students). Three t tests calculated between the population, the longitudinal sample, and the two sample subgroups showed a statistically significant difference ($p \leq .01$). However, the measure of percentage difference was less than 10% and the author considers the differences to be negligible, and asserts that composite ACT scores show that the longitudinal sample could be representative of the population.[4]

High school GPA. Table 7 shows a comparison between the mean self-reported HSGPA of the population and the mean HSGPA of the longitudinal sample. Results in Table 7 show that the longitudinal sample has a mean HSGPA about 12% higher than the population. A t test showed a statistically significant difference ($p \leq .01$) between the two groups, and the percentage difference exceeded 10% (-13%). Therefore, HSGPA gives evidence that the longitudinal sample was not representative of the population.

Table 7

Comparison Between Population and Longitudinal Sample by HSGPA

Groups	M HSGPA	SD	p-value	% difference	n
Population of 1996 entering freshmen[a]	3.25	0.47			1,780
Freshmen in longitudinal sample[b]	3.68	0.27	.000	-13	344

[a]Source: American College Testing Class Profile Freshman Class 1996-97

[b] Source: USU Registration Office through SIS-Plus

[4]As a bias check, Table 6 also compares the mean ACT composite scores of the two subgroups of the longitudinal sample, in-class responses and mailed responses. Results in Table 6 indicate that the spring sample and the two subgroups of that sample were not statistically different ($p \leq .01$). Confirming that bias was not introduced by the method used to obtain the spring sample.

Residency. Residency data were not available for the FTFT population. They were, however, available for all freshmen regardless of whether they were entering USU for the first time in fall 1996 and regardless of whether they were full-time students. Table 8 compares residency status of all freshmen and those in the longitudinal sample. Results in Table 8 show that the percentage of out-of-state residents in the longitudinal sample was similar to that of all 1996 freshmen. A *t* test showed no statistically significant difference ($p \leq .01$) between the two groups, and the percent difference was less than 10%. Residency, then, gives evidence that the longitudinal sample was representative of the population.

Table 8

Comparison Between Population and Longitudinal Sample by Residency Status

Groups	% Nonresident	*n*	*p*-value	% difference
Population of 1996 freshmen	31.6	2,442		
Freshmen in longitudinal sample	30	400	.000	5%

Note. Source is USU Office of Planning and Analysis, part-time and full-time freshmen, Fall 1996.

Nonresponse Bias Check

As mentioned in Chapter III, data were collected in August 1996 before freshmen entered USU and during spring quarter 1997. Each time, more freshmen were surveyed than were ultimately included in the longitudinal sample. These form the nonresponse groups, of which there were three in the nonresponse survey (NRS).

1. Freshman orientation attendees who provided data fall 1996 but not spring 1997.

2. Freshmen randomly selected from those not in the orientation and who never responded.

3. Freshmen randomly selected from all those not in the freshman orientation who responded in the fall but not in the spring.

For each group, a comparison was made on six variables: gender, ethnicity, year graduating from high school, composite ACT, self-ratings of academic ability, and self-ratings of social ability. These variables were selected because they were the only variables available to the researcher which were common to all three NRS groups and the longitudinal sample. Results of the bias check for each group follow.

NRS Group 1. Group 1 consisted of 620 freshman orientation attendees who responded fall 1996, but not spring 1997. Completed questionnaires were entered for a random sample of 63 respondents. These were chosen per the customary guideline of selecting 10% for nonresponse samples (Sailor, 1997). Table 9 presents a comparison between group 1 and the longitudinal sample. Results in Table 9 show what the author considers to be meaningful differences between NRS group 1 and the

Table 9

Comparison Between Longitudinal Sample and Group 1

Variable	Respondents (n = 400)	Nonrespondents (n = 63)	% Difference
Composite ACT ≥ 25	46%	23%	23%
Gender female	74%	56%	18%
Self-rating of social ability = average	27%	19%	8%
Self-rating of academic ability = average	34%	30%	4%
Graduated from high school in 1996	96%	98%	-2%
Ethnic status Caucasian	94%	95%	-1%

longitudinal sample (n = 400): Where composite ACT was ≥ 25 the difference was 23%, and on the percentage of females the difference was 18%. Results from this group thus indicate that systematic bias may be present in the longitudinal sample and that the sample may not be representative of the population.

NRS group 2. Group 2 consisted of freshmen who were selected from those not in the orientation and who never responded. Again, sample size was determined via the guideline of 10% (Sailor, 1997). Data collection for group 2 was attempted winter and spring quarters of 1997, but only 13 responses were obtained; therefore, the sample of 32 planned for this group was not completed. Table 10 compares group 2 to the longitudinal sample. Results in Table 10 show differences for all variables except ethnicity. The greatest difference was on age; when the percentage graduating from high school in 1996 was compared, the difference between respondents and nonrespondents was 50%. Also, on percent of females the difference was 35%. The author considers these differences to be meaningful. Results from group 2 suggest that systematic bias occurred in the selection of the longitudinal sample and that the sample may not be representative of the population of all freshmen.

Table 10

Comparison Between Longitudinal Sample and Group 2

Variable	Respondents	Nonrespondents	Difference
Graduated from high school in 1996	96%	46%	50%
Gender female	74%	39%	35%
Composite ACT ≥ 25	46%	22%	24%
Self-rating of social ability = average	34%	23%	11%
Self-rating of academic ability = average	62%	54%	8%
Ethnic status Caucasian	94%	92%	2%

NRS Group 3. Group 3 consisted of freshmen randomly selected from all those not in the freshman orientation who responded in the fall but not in the spring; 20 nonrespondents were selected. Prior to selecting the sample, each of the 20 individuals was qualified as a first-time entering student attending on campus. The total number of completed questionnaires obtained for NRS group 3 was 15. Results in Table 11 show meaningful differences between all variables except ethnicity and self-rating of social ability; the greatest difference was on age. When the percentage graduating from high school in 1996 was compared, the difference between respondents and nonrespondents was 36%. Also, on percent rating their academic ability as average the difference was 22%. The author considers these differences to be meaningful. Results from group 3 suggest that systematic bias occurred in the selection of the longitudinal sample and that it may not be entirely representative of the population.

Summary of Generalizability Analyses

Two variables produced differences between the longitudinal sample and the population that were meaningful to the author: gender (see Table 3) and HSGPA (see Table 7). However, these differences may be reasonably attributable to attrition in the

Table 11

Comparison Between Longitudinal Sample and Group 3

Variable	Respondents	Nonrespondents	Difference
Graduated from high school in 1996	96%	60%	36%
Self-rating of academic ability = average	62%	40%	22%
Composite ACT $\geq$ 25	46%	31%	15%
Gender female	74%	64%	10%
Ethnic status Caucasian	94%	93%	1%
Self-rating of social ability = average	34%	33%	1%

1996 freshman class (see Table 4). Two other variables showed the longitudinal sample to be representative of the population: ethnicity (see Table 5) and composite ACT (see Table 6). A comparison by residency between the longitudinal sample and all freshmen (see Table 8) also showed the longitudinal sample to be representative of the population. Results of the nonresponse bias check, however, showed meaningful differences between nonrespondents and the longitudinal sample for all three NRS groups (see Tables 9-11). It thus appears to the author that the generalizability analyses in Section A show that the longitudinal sample was not representative of the original population. However, these analyses also show that the longitudinal sample likely represents the population of fall 1996 freshmen who persisted through spring 1997 (see Tables 3, 5, and 6).

Section B: Descriptive Analyses of Freshman Microcomputer Use

The purpose of the descriptive analyses in Section B is to describe the three attributes of freshman microcomputer use in the model (breadth, frequency, and depth) and thereby address research questions 1 through 3. Most data are from fall 1996, but where necessary data obtained spring 1997 are reported.

Breadth of Microcomputer Use: Research Question 1

Breadth was examined in research question 1. The research question is, what types of microcomputer skills do freshmen at USU report being able to perform, and how many different skills do freshmen perform on microcomputers? Breadth was thus measured in three dimensions: (a) categories of microcomputer skills, (b) number of skills, and (c) number of software programs used in a typical session. (In Section

C, changes in breadth occurring during the freshman year will be examined; in Section E, breadth will be examined in relation to freshman development.)

Categories of skills. As described in Chapters II and III, a recently developed checklist of microcomputer skills (Furst-Bowe et al., 1995-1996) was adapted and administered to FTFT freshmen fall 1996 and spring 1997 (see Appendix I). The measure included items grouped in seven categories: basic skills, word processing, spreadsheet, database, graphics and multimedia, information retrieval, and programming. Results in Table 12 show the largest percentage of entering freshmen reported being able to use the Windows operating system (90%), produce a résumé (72.3%), and make a copy of a file (70.5%). The smallest percentage reported being able to write program in code (8.5%). Basic skills had the highest mean percentage (53.9) of reported ability. (In Appendix M a comparison is made between the longitudinal sample of 400 USU freshmen and the data from Furst-Bowe et al. [1995-1996]. Results in Appendix M show that percentages from this study are similar to those reported by Furst-Bowe et al., and provide evidence of the reliability and discriminate validity of the instrument.)

Number of skills. Besides categories of skills, the investigation of breadth included a count of the number of individual skills freshmen reported being able to perform on microcomputers. Table 13 presents an average for the number of skills reported fall 1996 with 19 being the maximum possible. Results in Table 13 show that prior to entering USU the mean number of skills reported by freshmen was 6.8.

Breadth of use in a typical session. In the survey administered in spring 1997, a single item was used to measure the number of software programs used during a typical session. Although freshmen may be familiar with a variety of activities (see Tables 12 and 13), this question looked at the number of software packages they

Table 12

Percentages of Entering Freshmen Reporting Ability in Microcomputer Skills

	Percent	Proportion
Basic Skills		
Use Windows	90.0	0.90
Make a copy of a file	70.5	0.71
Save a document to a disk	43.3	0.43
Install new software	39.0	0.39
Use Macintosh operating system	35.0	0.35
Teach yourself a new program	35.0	0.35
Word Processing Skills		
Produce a résumé	72.3	0.72
Produce a newsletter	50.8	0.51
Use mail merge	32.0	0.32
Spreadsheet Skills		
Enter data in a spreadsheet	48.8	0.49
Create a new spreadsheet	41.0	0.41
Formulas in a spreadsheet	30.5	0.31
Do spreadsheet macros	20.0	0.20
Database Skills		
Enter data into existing database	37.0	0.37
Sort and query a database	20.0	0.20
Functions for a database	14.5	0.15
Graphics Skills		
Use clip art	56.8	0.57
Create graphs from data	34.3	0.34
Information Retrieval Skills		
Send and receive e-mail	42.0	0.42
Retrieve info. over Internet	37.5	0.38
Electronic bulletin board	14.3	0.14
Programming		
Change a program	14.5	0.15
Test and debug a program	10.8	0.11
Write a program in code	8.5	0.09

N = 400

Table 13

Mean Number of Microcomputer Skills Reported Fall 1996

Number of skills reported	M	SD	Minimum	Maximum	n
Number of skills reported prior to entering	6.8	4.72	0	19	397

Note. Three students did not complete the scale in the fall; therefore n= 397.

reported using during a typical session at the microcomputer. Table 14 presents the results obtained from this item. Results in this table show that nearly the same percentage of students report using one software packages (37.5%) as reported using two software packages (39.5%). Combined, these two answers account for 77% of all responses.

Table 14

Software Packages Used During Typical Microcomputer Session Winter 1997

Only one software package	Usually two packages	Three different packages	Four or more each time	N
37.5%	39.5%	17.0%	4.5%	400

Summary of breadth. In fall 1996, entering freshmen were asked to report what they could do in seven categories of microcomputer skills; the largest percentages reported skills in the categories of basic skills, word processing, and graphics (see Table 12). The smallest percentage reported skills in programming. When individual skills were investigated, the highest percentages of freshmen reported being able to use the Windows operating system, produce a résumé, and make a copy of a file. The mean number of skills checked by freshmen in fall 1996 was 6.8 (Table 13). In spring 1997, when asked how many software packages they used during a typical

microcomputer session during winter quarter 1997, most freshmen (77%) said they used one or two different software packages (see Table 14).

Frequency of Microcomputer Use: Research Question 2

Frequency of microcomputer use was examined in research question 2 (RQ2). The research question has two parts; (a) how often do USU freshmen use microcomputers and (b) when they use microcomputers, how long does a session last? Frequency was measured in three dimensions: (a) the frequency of microcomputer use during the year prior to entering USU, (b) hours per week using microcomputers, and (c) the length of microcomputer use sessions. (In Section C, changes in frequency and session length occurring in the freshman year will be examined, and in Section E the relation between frequency and freshman development will be examined.)

Frequency prior to entering USU. In fall 1996, entering freshmen indicated if they used a microcomputer frequently, occasionally, or not at all during the past calendar year. Definitions for these levels of use were left to the respondent per Astin (1993). Responses are summarized in Table 15. Results in this table show a majority of students (55.3%) reported using a microcomputer frequently in the past year.

Table 15

General Frequency of Microcomputer Use the Year Prior to Entering USU

	Frequency of use: Year prior to entering USU		
Use of microcomputers	Not at all	Occasionally	Frequently
Frequency	24	155	221
Percentage	6	38.8	55.3

Hour per week use of microcomputers. To measure involvement, freshmen were asked to report hours per week they used a computer for assignments, playing games, talking to friends or family, or making new friends. Values for variables were on a 7-point, Likert-type scale (Astin, 1993). Results obtained from these variables are shown in Table 16. The results presented show freshmen reported average weekly use of just under 5 hours per week. Although time spent playing computer games averaged half an hour per week, this activity showed considerable variation (SD = .9)

Table 16

Frequency of Microcomputer Use Spring 1997

	Frequency of Microcomputer Use		
Types of microcomputer use	M[a]	SD	hours
Using a computer for assignments	2.5	1.1	2.8
Playing computer games	0.5	0.9	0.5
Using a computer to talk to friends or family or to make friends	1.9	1.2	1.5
Total hours	--	--	4.8

Note. n was 397 because three freshmen left these questions blank.

[a] The scale upon which these values are based was 1 = < 1 hrs/wk, 2 = 1-2 hrs/wk, 3 = 3-5 hrs/wk, 4 = 6-10 hrs/wk, 5 = 11-15 hrs/wk, 6 = 16-20 hrs/wk, 7 = >20 hrs/wk)

Session length. Session length was another dimension of frequency of use. Self-report data on session length were gathered only once, during spring quarter 1997, and are presented in Table 17. Results in Table 17 show that a majority (88.6%) of freshmen reported spending an hour or less each time they used a microcomputer. Form these data, it was estimated that on the average a typical session at the microcomputer lasted 45 minutes or about the length of one class session.[5]

[5] Computer lab entry data supplied by USU Computer Services indicates the average freshman entries as two per week, and peak usage of computer labs occurring between the times of 10:00 and 11:00 a.m. (see Appendix N).

Table 17

Percentages of Freshmen Reporting Duration of Microcomputer Session Spring 1997

0	< .25 hr	.25 to .5 hr	.5 to 1 hr	1 to 2 hrs	> 2 hrs
4.3%	13.8%	42.3%	32.5%	7.3%	--

Summary of frequency (RQ2). Frequency was measured in three dimensions: (a) the frequency of microcomputer use during the year prior to entering USU, (b) hour per week using microcomputers, and (c) the length of microcomputer use sessions. Results from RQ2 showed that a majority of freshmen reported using a microcomputer frequently in the year prior to entering USU (see Table 15). Spring 1997 data showed that during their first academic year freshmen typically spent just under 5 hours per week using a microcomputer (Table 16). For session length, self-reported results indicated that a typical microcomputer session for a majority of freshmen (88.6%) lasted less than an hour (see Table 17).

Depth of Use: Research Question 3

Depth of microcomputer use was examined in research question 3 (RQ3). The research question is, how confident are USU freshmen about learning to use new microcomputer software? Depth was operationalized as strength of computer self-efficacy (Compeau & Higgins, 1995). (In Section C, changes in computer self-efficacy occurring in the freshman year will be examined, and in Section E the relation between computer self-efficacy and student development will be examined.)

In the instrument used to measure computer self-efficacy (Compeau & Higgins, 1995), there were 10 questions presenting various circumstances that could be encountered in completing an assignment using new software (see Appendix D).

Strength of computer self-efficacy was the confidence rating per respondent (maximum possible = 10) for each of 10 questions. Table 18 presents the 10 questions and corresponding mean ratings of computer self-efficacy strength. Results in Table 18 shows a range of computer self-efficacy scores depending upon the circumstance: Freshmen were most confident using new software when they had used a similar program before (M= 8.18), and they were least confident when personal assistance was not available (M= 3.19). For all items, the mean computer self-efficacy strength score obtained in fall 1996 was 6.02. (In Section C, these computer self-efficacy scores were compared to spring 1997 scores.) Standard deviations consistently decline as mean computer self-efficacy scores increase, indicating a high degree of agreement among respondents (r = -.83).

Table 18

Computer Self-Efficacy Reported Fall 1996

Computer self-efficacy subscales	M	SD
If I had seen someone else using it before trying it myself.	4.27	2.59
If there was no one around to tell me what to do as I go.	3.19	2.48
If I had never used a package like it before.	4.98	2.63
If I had only software manual for reference.	5.47	2.40
If I had a lot of time to complete the job.	6.96	2.28
If I had just the built-in help for assistance.	7.08	2.18
If I could call someone for help if I got stuck.	6.68	2.47
If someone else had helped me get started	5.55	2.47
If I had used similar packages before to do the same job.	8.18	1.93
If someone showed me how to do it first.	7.86	2.10
Mean strength of computer self-efficacy	6.02	2.35

Note. Ten points possible per item and for the overall mean.

Depth of microcomputer use corresponded to strength of computer self-efficacy. Mean strength scores were in the moderate range (M = 6.02) with a negative correlation evident in the standard deviations (see Table 18). In sum, freshmen were moderately confident about completing an assignment using new software.

Summary of Descriptive Analyses in Section B

Section B described the three attributes of freshman microcomputer use in the model: breadth, frequency, and depth. Breadth was first described as microcomputer skills arranged in seven categories; the skill with the largest percent of entering freshmen reporting ability was Windows operating system (90%), produce a résumé (72.3%), and make a copy of a file (70.5%). The smallest percent reported being able to write program in code (8.5%; see Table 12). Next, breadth was described as the number of skills reported by freshmen fall 1996; the mean was 6.8 out of 19 (see Table 13). Lastly, breadth was described as the number of software packages typically used. In spring 1997, most freshmen (77%) said they used one or two different software packages during a typical microcomputer session (see Table 14). Frequency was measured in three dimensions: (a) the frequency of microcomputer use during the year prior to entering USU, (b) hour per week using microcomputers, and (c) the length of microcomputer use sessions. Results showed that a majority of freshmen reported using a microcomputer frequently in the year prior to entering USU (see Table 15). Spring 1997 data showed that during their first academic year freshmen typically spent just under 5 hours per week using a microcomputer (Table 16). For session length, self-reported results indicated that a typical microcomputer session for a majority of freshmen (88.6%) lasted less than an hour (see Table 17). Depth of microcomputer use corresponded to strength of computer self-efficacy. Mean strength scores were in the

moderate range, but clearly varied by circumstance (see Table 18). Analysis showed a negative correlation between mean strength of confidence scores and standard deviations indicating a high degree of agreement among respondents (r = -.83).

Section C: Changes in Microcomputer Use: Research Question 4

The purpose of the longitudinal analyses in Section C is to report changes that occurred during the first academic year with each of the three attributes of microcomputer use reported in Section B: breadth, frequency, and depth. In the exploratory model presented in Figure 1, change was the fourth attribute of microcomputer use. Changes in freshman microcomputer use occurring during the first academic year were examined using longitudinal analyses; these analyses addressed research question 4 (RQ4). The research question was, for FTFT freshmen, how does microcomputer use change over the first academic year at USU? (In research questions 7 and 8 the relation between changes in microcomputer use and freshman development was examined.)

Changes in Breadth

Change in categories of skills. Seven categories of skill variables based on industry-accepted software types (Furst-Bowe et al., 1995-1996) were used to research breadth of use: basic skills, word processing, spreadsheet, database, graphics and multimedia, information retrieval, and programming (see Sec. B, RQ1). Table 19 shows the fall and spring mean proportions of FTFT freshmen who reported skill in each category, improvements over the year, and a correlation coefficient for each pair of fall-spring means. Category results in Table 19 are aggregates of an

item-by-item analysis contained in Appendix J.[6] Results in Table 19 show that the largest mean improvement for a skill category was in information retrieval (% diff= 132). The smallest mean improvement occurred in programming skills (% diff= 6%). Statistically significant differences ($p \leq .01$) in means occurred for all skill categories. Correlation coefficients (r) in Table 19 describe magnitude of the mean improvement. For example, word processing skills had one of the lowest percent differences (% diff= 27%), yet the highest r (.46). This indicates that although change was not large, freshmen who reported word processing skills in fall 1996 consistently reported more skills in that category in spring 1997. As another example, the percent difference for

Table 19

Changes in Proportion of Microcomputer Skills Reported by Freshmen

Skill categories	M Fall 1996	M Spring 1997	M difference	% difference	r
Information retrieval skills	0.31	0.71	0.41**	132%	0.38
Database skills	0.24	0.48	0.24**	100%	0.38
Spreadsheet skills	0.35	0.55	0.20**	57%	0.41
Basic computer skills	0.54	0.82	0.28**	52%	0.31
Graphics skills	0.46	0.70	0.24**	52%	0.23
Word processing skills	0.52	0.66	0.14**	27%	0.46
Programming skills	0.11	0.18	0.07**	6%	0.39

Note. Five freshmen did not have fall-spring matched data; therefore n = 395.

** Statistically significant difference at $p \leq .01$.

[6] Appendix J shows that the greatest change occurred for sending and receiving e-mail (M diff = .54) and retrieving information over the Internet (M diff = .50). The smallest change occurred for saving a document to a disk (M diff = .03) and changing an existing program (M diff = .04).

graphics skills indicated moderate improvement (% diff= 52%); however, the correlation coefficient (r = .23) suggests that freshmen did not consistently report improvement, that is, some reported having a skill in fall 1996 that they did not report having in spring 1997.

Change in the number of skills. Table 20 contains a comparison between the average number of skills reported fall 1996 and spring 1997. Results in Table 20 show that the mean number of skills reported by freshmen increased from 6.8 to 10.6, an increase of 56% over the year.

Table 20

Mean Number of Microcomputer Skills Reported Fall 1996 and Spring 1997

Number of skills reported	Mean	SD	Minimum	Maximum	n
Number of skills reported fall 1996	6.8	4.72	0	19	397
Number of skills reported spring 1997	10.6	4.55	0	19	399

Note. Three students did not complete the scale in the fall; therefore n = 397.

Changes in Frequency

Change in the long-term frequency. To show change in frequency of microcomputer use occurring between fall and spring, Table 21 divides the longitudinal sample into three groups: those who reported their frequency of microcomputer use during the year prior to entering USU as not at all, those who reported it as occasional, and those who reported it as frequent (see Table 15). These subgroups are compared on average reported hours per week use of a computer for assignments, playing games, and talking to family and friends. Results in Table 21 show that by spring 1997 there was little practical difference between the subgroups. All students reported similar microcomputer use at USU no matter what their reported use was

Table 21

Comparison of First Year Use of Microcomputers by Pre-Entry Frequency Subgroups

	Not at all (n = 24)			Occasionally (n = 153)			Frequently (n = 220)[a]		
	M	SD	hours	M	SD	hours	M	SD	hours
Using a computer for assignments	2.25	1.11	2.5	2.22	1.09	2.5	2.60	1.15	2.8
Playing computer games	0.42	0.72	0.4	0.48	0.87	0.5	0.50	0.88	0.5
Using a computer to talk to friends/family or make friends	1.71	1.04	1.4	1.75	1.17	1.4	2.00	1.17	1.5
Total hours			4.3			4.4			4.8

Note. The scale upon which values are based was 1 = < 1 hrs/wk, 2 = 1-2 hrs/wk, 3 = 3-5 hrs/wk, 4 = 6-10 hrs/wk, 5 = 11-15 hrs/wk, 6 = 16-20 hrs/wk, 7 = >20 hrs/wk.

[a] Three students did not provide complete data; therefore n = 397.

before. This suggests that freshmen with occasional or no use prior to entering USU increased their frequency to a level similar to the majority of freshmen.

A one-way ANOVA was used to test the statistical significance of the differences of the pre-entry subgroups (see Appendix P, Table P-1). The ANOVA showed a statistically significant difference. However, a post hoc Fisher's LSD test showed a statistically significant difference ($p \leq .01$) occurred for only one of the nine pairs of means (see Table P-2). The results indicate no meaningful difference between the spring 1997 frequency of use of the three subgroups (also see Appendix V).

Change in short-term frequency. As another measure of changes in frequency, a comparison of freshmen's expected and reported hour-per-week microcomputer use is presented in Table 22. Results in Table 22 show that freshmen generally overestimated how much they would use microcomputers during their first year at USU. Freshmen expected to use microcomputers over 7 hours per week, but reported use was just under 5 hours per week; actual use of microcomputers for assignments

Table 22

Frequency of Microcomputer Use Comparing Fall 1996 and Spring 1997

	Fall 1996: Expected use (n = 395)[a]		Spring 1997: Actual use (n = 397)[b]		Difference		
Types of use	M*	hours	M*	hours	M	%	r
Using a computer for assignments	3.4	5.8	2.5	2.8	-1.0	-29%	.2
Playing computer games	0.6	0.6	0.5	0.5	-0.1	-17%	.3
Using a computer to talk to friends/family or make friends	1.3	1.0	1.9	1.5	0.5	38%	.4
Total hours		7.4		4.8			

Note. The scale upon which these values are based was 1 = < 1 hr/wk, 2 = 1-2 hr./wk, 3 = 3-5 hr/wk, 4 = 6-10 hr/wk, 5 = 11-15 hr/wk, 6 = 16-20 hr/wk, 7 = >20 hr/wk.

[a] In the fall, n was 395 because five freshmen failed to complete these three questions.

[b] In the spring, n was 397 because three freshmen left these questions blank.

was 3 hours less than was expected. However, use of computers to talk to family and friends was half an hour per week more than was expected.

Changes in Depth

In Table 23, depth of use data, or computer self-efficacy strength, obtained from freshmen fall 1996 (see Table 18) and spring 1997are presented. Comparisons of these scores are made using paired mean differences, statistical significance ($p \leq .01$), percent difference, and correlation (r). Mean difference (M diff) scores were obtained by subtracting fall 1996 scores from spring 1997 scores. Percent difference was obtained by dividing mean difference by the fall 1996 scores. Results in Table 23 show that all percent differences were small (< 30%) though all were positive. Specific mean differences show that freshman confidence in learning new software increased the most when no one was around to help during the learning (% diff= 27%) and when

Table 23

Paired Differences Between Fall and Spring Computer Self-Efficacy Scores

Computer self-efficacy subscales	Fall 1996	Spring 1997	M diff	% difference	r
If there was no one around to tell me what to do as I go.	3.19	3.91	.85**	27%	.5
If I had seen someone else using it before trying it myself.	4.27	5.10	.90**	21%	.56
If I had never used a package like it .	4.98	5.64	.72**	14%	.5
If I had only the software manual.	5.47	6.36	.66**	12%	.55
If I had a lot of time to complete the job for which the software was provided.	7.00	7.51	.62**	9%	.52
If I had just the built-in help.	7.09	7.47	.62**	9%	.49
If I could call someone for help.	6.68	7.29	.54**	8%	.5
If someone else had helped me get started	5.55	6.17	.38**	7%	.5
If I had used similar packages before this one to do the same job.	8.18	8.46	.31**	4%	.41
If someone showed me how to do it first.	7.87	8.12	.28**	4%	.43
Mean strength of computer self-efficacy	6.02	6.60	.58**	10%	.50

Note. Scale had anchor points 1= not at all confident and 10 = totally confident.

[a] N = 400

** $p \leq .01$.

they had seen someone else using the software before trying it (% diff= 21%). Correlation coefficients (r) in Table 23 describe the magnitude of the mean differences and are generally strong (Cohen & Cohen, 1983); this indicates that although change was small, freshmen consistently reported higher levels of computer self-efficacy in spring 1997.

Summary of Changes in Microcomputer Use

RQ4 examines changes over the freshman year in three dimensions of microcomputer use: breadth, frequency, and depth. In the spring, freshman breadth

showed the greatest increase in information retrieval skills, i.e., sending and receiving e-mail and retrieving information over the Internet (see Table 19 and Appendix J). Also, the number of skills freshmen reported having increased by an average of 56% in the first academic year at USU (see Table 20). Frequency of use results indicate that all freshmen tend to use microcomputers with about the same frequency regardless of their reported level of use prior to entering USU (see Table 21). However, reported hours of microcomputer use during spring 1997 were below what freshmen had expected (see Table 22). Although average freshman computer self-efficacy strength (depth) increased at most by only about 30%, this measure of computer confidence showed improvement across all given situations (see Table 23).

Section D: Description of Freshman Development

The purpose of Section D is to describe the criterion variable in this study, freshman development. Freshman development as defined here has two aspects, social development and intellectual development. Social development was measured in five dimensions; three were related to social integration and two were related to satisfaction with social development. Results in this section draw from data collected spring 1997 and address research questions 5 and 6.

Freshman Social Development: Research Question 5

Freshman social development was examined in research question 5 (RQ5). The research question has two parts: to what degree do freshmen attending USU experience social development, and how satisfied are they with their social development. The first part of RQ5 was measured using three factors of social integration: (a) Peer Interaction, (b) Faculty Interaction, and (c) Institutional Concern

for Student Development. The second part of the research question was measured in two dimensions: (a) expected versus reported hour per week involvement in social activities, and (b) satisfaction with progress toward completing social goals. (In Section E, predictor variables representing involvement, satisfaction, and behavior [including microcomputer use] were entered into regression analyses to determine their relationship with criterion variables representing the three factors of social integration.)

RQ5, part 1: social integration. Freshman social development was initially operationalized as social integration (see Astin, 1992; Pascarella & Terrenzini, 1980; Tinto, 1993). Social integration was defined as the level of contact with peers and faculty (Tinto, 1993). Using Pascarella and Terrenzini's (1980) measure of student integration (see Appendix U) freshmen were asked their agreement with statements about the quality of Peer and Faculty Interactions, their own performance, and the quality of courses (see Appendix D). Data from this measure were entered in a factor analysis and compared to factors from Pascarella and Terrenzini for validation. Two of the social integration factors, Peer-Group Interaction and Interaction with Faculty, were similar[7] (see Appendix O); the third factor, Faculty Concern for Student Development and Teaching, however, differed slightly and was therefore renamed Institutional Concern for Student Development (see Appendix K).[8] Items that formed a factor were

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[7] Comparing Cronbach's alpha obtained by Pascarella and Terrenzini (1980) and from this study for the three factors: Peer Interaction was .84 and .66, Faculty Interaction was .83 and .81, and Institutional Concern was .82 and .79.

[8] In the factor analysis, this third factor contained the same variables as in Pascarella and Terrenzini (1980) relating to faculty concern for student development and teaching. In addition, two variables entered this factor which measured concern expressed by peers and general intellectual stimulation of courses during the year.

averaged for each student (per Kennedy, Gordon, & Gordon, 1995). Table 24 presents the percentage of positive responses for the three dimensions. ("Strongly agree" and "agree" were combined and labeled "positive", and "strongly disagree" and "disagree were combined and labeled "negative.") Results in Table 24 show that nearly all freshmen (94.2%) were positive about Peer-Group Interaction. Three out of four freshmen (75.0%) were positive about Institutional Concern for Student Development and two out of three (63.9%) were positive about Interactions with Faculty.

Table 24

Percentage of Positive Freshmen Responses for Three Social Integration Factors

Dimension	% Positive
Peer-Group Interaction	94.2
Institutional Concern for Development	75.0
Interactions with Faculty	63.9

Note. N = 400.

RQ5, part 2: satisfaction with social development. Part 2 contains, (a) freshman satisfaction with reported hour-per-week involvement in social activities, and (b) satisfaction with progress toward completing social goals.

Hour-per-week involvement in social activities was the first dimension of freshman satisfaction with social development (Astin, 1990). Table 25 presents the hours per week that entering FTFT freshmen expected to be involved in four social activities compared to the actual hours of involvement. The difference between expectation and actual experience defines the level of satisfaction (Vavra, 1997; Zeithaml et al., 1990) and was measured as the mean difference (m diff) between the expected and

Table 25

Comparison Between Freshmen Expected and Reported Hour-per-Week Involvement in Social Activities

	Fall 1996: Expected use		Spring 1997: Actual use		Differences		
Variables	M	hours	M	hours	m diff	% diff	r
Talking with teachers outside of class	1.92	1-2	.90	<1	-1.0	-52%	.24**
Volunteer work	1.74	1-2	1.17	<1	-0.6	-33%	.35**
Exercising or doing sports	3.44	3-5	3.04	3-5	-0.4	-12%	.54**
Social activities with friends not studies	3.93	6-10	4.17	6-10	0.2	5%	.35**

Note. The scale upon which these values are based was 1 = < 1 hr/wk, 2 = 1-2 hr./wk, 3 = 3-5 hr/wk, 4 = 6-10 hr/wk, 5 = 11-15 hr/wk, 6 = 16-20 hr/wk, 7 = >20 hr/wk.

[a] Matched pairs of data were not completed by seven freshmen, therefore, n was 393.

** Significant at the $p \leq .01$ level (2-tailed).

reported hours of involvement. Results in Table 25 show that the mean difference was largest for talking with teachers outside of class (m diff= -1.0); note that this difference was negative, indicating dissatisfaction. The one positive mean difference, also the smallest, was for social activities with friends that were not related to studies (m diff= .02). Correlation coefficients (r) in Table 25 describe the magnitude of the mean differences and are moderate to strong (Cohen & Cohen, 1983) and were all statistically significant ($p \leq .01$).

Satisfaction with progress on social goals was the second dimension of satisfaction with social development. Again, satisfaction was defined as the difference between expectation and experience (Vavra, 1997; Zeithaml et al., 1990) and was measured as the percent difference between importance of a goal and satisfaction with progress toward that goal. Table 26 presents mean ratings of importance, mean

Table 26

Satisfaction with Social Goals Spring 1997

Goals	m Important	m Satisfied	m difference	% difference	r
Find a lifetime partner	2.70	1.90	-.73	-27	-.10
Develop leadership skills	3.2	2.5	-.66	-21	.26**
Be involved in student activities	3.3	2.6	-.66	-20	.13**
Get advice on my goals	2.9	2.4	-.53	-18	.18**
Develop helping skills	3.2	2.9	-.32	-10	.21**
Develop better self understanding	3.4	3.2	-.22	-7	.19**
Improve communication with friends	3.2	3.1	-.09	-3	.07
Be involved in sports	2.3	2.5	.16	7	0.2

Note. The scale was 1 = not...4 = very, and n = 398 because paired data were not complete for two freshmen.

** Significant at the $p \leq .01$ level (2-tailed).

ratings of satisfaction, mean differences, percentage difference, and correlation coefficients for eight social development goals adapted from Calder (1993). Results in Table 26 show that mean differences were almost all negative, representing dissatisfaction. However, percentage differences between importance and satisfaction were all less than 30%: Freshmen reported the most dissatisfaction with the goals to find a lifetime partner (% diff= -27%), to develop leadership skills (% diff= -.20%), and to be involved in student activities (% diff= -20%). The one goal that yielded a positive mean difference, also yielding the smallest difference, was the goal to be involved in sports (% diff= 7%). Generally, correlation coefficients show a weak relationship (Cohen & Cohen, 1983) between ratings of importance and ratings of reported satisfaction with progress.

Summary of social development (RQ5). Social development was measured in five dimensions; three were related to social integration and two were related to

satisfaction with social development. Freshman responses on the three dimensions of social integration were as follows: Almost all freshmen were positive about Peer-Group Interaction, three out of every four were positive about Institutional Concern about Student Development, and two out of every three were positive about Interactions with Faculty (see Table 24).

The first dimension of satisfaction with social development was expected versus reported hour-per-week involvement in social activities. The largest mean difference between expected and experienced hours-per-week involvement, representing dissatisfaction, was in talking with teachers outside of class (M = -1.0). The one positive mean difference was for social activities with friends which were not related to studies (M = .02, see Table 25). In the second dimension of satisfaction with social development, mean differences between goal importance and satisfaction were largest for goals relating to finding a lifetime partner (m diff = -.73), developing leadership skills (m diff = -.66), and being involved in student activities (m diff = -.66, see Table 26).

Intellectual Development: Research Question 6

Freshman intellectual development was examined in research question 6 (RQ6). The research question has two parts, what do indicators of intellectual development tell us about the experience of freshmen at USU, and how satisfied are they with their intellectual development. The first part of RQ6 was measured using three factors for academic integration: (a) Academic and Intellectual Development, (b) Institutional and Goal Commitments, and (c) Cumulative USU GPA. The second part of the research question was measured in two dimensions: (a) expected versus reported hour-per-week involvement in academic activities and (b) satisfaction with progress toward

completing academic goals. (In Section E, predictor variables representing involvement, satisfaction, and behavior [including microcomputer use] were entered into regression analyses to determine their relationship with the two dimensions of academic integration and cumulative GPA.)

RQ6, part 1: Academic integration. Academic integration was defined by Tinto (1993) as the level of students' performance. In testing Tinto's definition, Pascarella and Terrenzini (1980) identified two factors that correlated with students' academic integration into the college environment; these two factors were Academic and Intellectual Development and Institutional and Goal Commitments.[9] Pascarella and Terrenzini's factor analysis is reproduced in Appendix Q. As explained in RQ5, a factor analysis yielded factors similar to those produced by Pascarella and Terrenzini (see Appendices K and Q). Therefore, the same factors were used to describe academic integration in this study, and items that grouped in a factor were averaged for each student (per Kennedy et al., 1995). Table 27 presents the percentage of positive responses for the two academic integration factors. Results in Table 27 show

Table 27

Positive Responses for Factors of Academic Integration

Factors	% Positive
Institutional and Goal Commitments	95.4
Academic and Intellectual Development	85.1

Note. Originally a 4-point scale with choices strongly agree, agree, disagree, and strongly disagree was used; however, for brevity only positive responses are reported which represent the combination of strongly agree and agree responses.

[9] Pascarella and Terrenzini (1980) define this factor as the commitment of students to the institution and to their own personal goals.

that 95% of USU freshmen gave positive responses to items aggregated in the factor Institutional and Goal Commitments and 85% were positive about Academic and Intellectual Development.

Cumulative GPA. Data comparing HSGPA with cumulative GPA for freshmen's first year at USU are presented in Table 28. Results in Table 28 show that the average spring 1997 USU GPA of the sample was .5 below their HSGPA.

Table 28

Comparing HSGPA and Spring 1997 USU GPA

HSGPA		USU GPA			
M	SD	M	SD	M diff	n
3.7	0.3	3.2	0.6	0.5	398

Note. HSGPA was obtained through student self-report.[10] USU GPA was obtained through USU Computer Services.

RQ6, part 2: satisfaction with intellectual development. Freshman satisfaction with intellectual development was measured in two dimensions: (a) expected versus reported hour-per-week involvement in academic activities and (b) satisfaction with progress toward completing academic goals.

Hour-per-week involvement in academic activities was the first dimension of freshman Satisfaction with Intellectual Development (Astin, 1990). Table 29 presents the hours per week entering FTFT freshmen expected to be involved in three academic activities compared to the reported actual hours of involvement. Again, the difference between expectation and experience defines the level of satisfaction

[10] To test the reliability of self-report data provided by the sample of USU freshmen in this study, reported composite ACT scores were compared to those in the USU database. Results showed 25% misrepresented their score.

Table 29

Comparison of Hours per Week of Involvement in Academic Activities

	Fall 1996: Expected use		Spring 1997: Actual use		Statistical comparison		
Variables	hours	M	hours	M	M diff	% diff	r
Studying or doing homework	11-15	4.91	6-10	4.15	-.8	-16%	.34**
Working with friends on homework	3-5	3.02	1-2	1.97	-1.1	-36%	.29**
Using a library	3-5	3.44	1-2	1.76	-1.7	-49%	.26**

Note. Matched pairs of data were not completed by seven freshmen, therefore, n was 393.

** Significant at the $p \leq .01$ level (2-tailed).

(Vavra, 1997; Zeithaml et al., 1990) and was measured as the percent difference (% diff) between the expected and reported hours of involvement. Results in Table 29 show that the percent difference was largest for using a library (% diff = -49%) and smallest for studying or doing homework (% diff = -16%); note that these differences are negative, indicating dissatisfaction. Correlation coefficients (r) were moderate (Cohen & Cohen, 1983) and were all statistically significant ($p \leq .01$). The strongest correlation was for studying or doing homework ($r = .34$) and the weakest correlation was for using a library ($r = .26$).

Satisfaction with progress on academic goals was the second dimension of Satisfaction with Intellectual Development. Again, satisfaction is defined as the difference between expectation and experience (Vavra, 1997; Zeithaml et al., 1990) and is measured here as the percentage difference between importance and satisfaction. Table 30 presents freshman mean ratings of importance and satisfaction with personal progress toward completing academic and career-related goals (Calder, 1993). Results in Table 30 show that mean differences were all negative, representing dissatisfaction; respondents reported the most dissatisfaction with the career goal to obtain a job

Table 30

Satisfaction with Academic Goals Spring 1997

Goals	M Important	M Satisfied	M difference	% difference	r
Obtain a job related to my studies	3.7	1.8	-1.9	-51%	-.00
Make potential business contacts	2.7	1.5	-1.2	-44%	.26**
Explore potential jobs and careers	3.7	2.4	-1.3	-35%	.10
Improve my writing skills	3.2	2.4	-0.8	-25%	.16**
Improve my study skills	3.5	2.7	-0.8	-23%	.07
Be confident about graduating	3.5	2.7	-0.8	-23%	.10
Improve my computer skills	3.4	3.0	-0.4	-12%	.17**
Perform better under pressure	3.0	2.8	-0.2	-6%	.06

Note. The scale was 1 = not...4 = very, and n = 398 because paired data were not completed by two freshmen.

** Significant at the $p \leq .01$ level (2-tailed).

related to my studies (% diff= -51%). Percent difference was smallest for the goals to improve computer skills (% diff = -.12%) and perform better under pressure (% diff = -6%). Correlation coefficients were generally weak (Cohen & Cohen, 1983); for only three academic activities were correlations statistically significant ($p \leq .01$). Weak correlations may indicate freshmen were less satisfied than is apparent in analysis of mean differences.

Summary of results for intellectual development. Intellectual Development was measured in five dimensions; three were related to academic integration and two were related to satisfaction with Intellectual development. Most freshmen were positive about their academic integration into USU (see Table 27). On the average the spring USU GPA was .5 below HSGPA (see Table 28). The first dimension of Satisfaction with Intellectual Development was expected versus reported hour-per-week involvement in academic activities: the largest mean difference between expected and

experienced hour-per-week involvement, representing dissatisfaction, was in using the library (see Table 29). The second dimension of Satisfaction with Intellectual Development was satisfaction with progress on academic goals. Here, mean differences between goal importance and satisfaction was largest for the goal obtaining a job related to studies (% diff= -51%; see Table 30).

Section E: Regression Analyses

The purpose of the regression analyses is to explore the relationship between freshman microcomputer use and freshman development. Section E is in three parts: The first part is an overview of the 12 regression analyses and has three components: (a) a summary of the statistical significance of the analyses, (b) tests of the assumptions for the data in these analyses, and (c) the structure of the regression tables presented in the second part of Section E. The second part presents results obtained for research questions 7 and 8; in research question 7 (RQ7) the relationship between microcomputer use and social factors of freshman development was investigated, and in research question 8 (RQ8) the relationship between microcomputer use and intellectual factors of freshman development was investigated. Part 3 is a synthesis of the 12 regression analyses presented in the 24 tables of Part 2; it aggregates results into six tables.

Part 1.a: Summary of Statistical Significance

Results from RQ5 established Pascarella and Terrenzini's (1980) five factors of social and academic integration[11] as the preferred dependent measures of freshman

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[11]Social integration factors were Faculty Interaction, Interaction with Peer Group, and Faculty Concern for Student Development. Academic integration factors were Academic and Intellectual Development and Institutional and Goal Commitments.

development; therefore, those factors were chosen for the regression analyses. (In addition, GPA, the conventional measure of academic integration, was added as a sixth factor.) Two regression analyses were completed for each of these factors resulting in a total of 12. The first utilized all 253 predictor variables representing demographics, involvement, satisfaction, and microcomputer use; the second used just the 145 computer-related predictor variables.[12] The analysis of all variables serves as context for the analysis of only computer-related variables.

Table 31 compares the statistical significance and adjusted $\underline{R}^2$ of the 12 analyses conducted for RQ7 and RQ8.[13] Results reported in Table 31 show that, when forming a model, the predictor variables entered into each of the regression equations accounted for a statistically significant portion of freshman development. The degree of statistical and practical significance for individual predictor variables in each analysis will be presented in Part 2.

Part 1.b: Tests of Assumptions for Analyses

To test the goodness of fit of the data for regression analysis, residual analyses were performed (Norusis,1990). The results of residual analyses are summarized in Table 32. Results indicate that data in the 12 regression analyses met the required assumptions: outliers were few in number, and the data can be said to have fit the model. Histograms for criterion variables exhibited a normal curve, and the

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[12]The exceptionally large number of predictor variables is due to the exploratory nature of the study; as noted in the literature review, previous work was not found that could direct the selection of predictor variables.

[13]In Table 31 and throughout Section E, adjusted $\underline{R}^2$ is used instead of unadjusted $\underline{R}^2$ because it is preferred for accuracy in reporting the portion of total variance attributed to the model (personal communication, Ron Thorkildsen, June 6, 1998). In Table 31 only unadjusted $\underline{R}^2$ is included for comparison.

Table 31

Overview of Regression Analysis Models Utilized for RQ7 and RQ8

Order	Development factors	R^2	Adjusted R^2	F-value
RQ7: Social Development Factor 1: Faculty Interaction				
	All variables	0.493	0.467	19.026**
	Computer-related	0.140	0.131	15.114**
RQ7: Social Development Factor 2: Peer-Group Interaction				
	All variables	0.390	0.35	9.869**
	Computer-related	0.071	0.061	7.073**
RQ7: Social Development Factor 3: Institutional Concern for Student Development				
	All variables	0.341	0.307	10.567**
	Computer-related	0.110	0.098	9.215**
RQ8: Intellectual Development Factor 1: Academic and Intellectual Development				
	All variables	0.490	0.467	20.646**
	Computer-related	0.118	0.101	7.027**
RQ8: Intellectual Development Factor 2: Institutional and Goal Commitment				
	All variables	0.443	0.412	14.424**
	Computer-related	0.129	0.115	9.115**
RQ8: Intellectual Development Factor 3: Spring USU GPA 1997				
	All variables	0.669	0.653	116.359**
	Computer-related	0.188	0.169	9.687**

** Significant at the $p \leq .01$ level (2-tailed).

Table 32

Summary of Residual Analyses

Order	Development factors	Number of outliers	Normal curve	M standard residual
RQ7: Social Development Factor 1: Faculty Interaction				
	All variables	3	Yes	.036
	Computer-related	0		.014
RQ7: Social Development Factor 2: Peer-Group Interaction				
	All variables	5	Yes	-.007
	Computer-related	2		.006
RQ7: Social Development Factor 3: Institutional Concern for Student Development				
	All variables	0	Yes	-.065
	Computer-related	2		-.008
RQ8: Intellectual Development Factor 1: Academic and Intellectual Development				
	All variables	1	Yes	.002
	Computer-related	0		.028
RQ8: Intellectual Development Factor 2: Institutional and Goal Commitment				
	All variables	1	Yes	-.007
	Computer-related	1		.011
RQ8: Intellectual Development Factor 3: USU GPA spring 1997				
	All variables	1	Yes	.036
	Computer-related	2		.018

mean standard residuals showed little departure from normality. Because only extreme departures from normality jeopardize interpretation of results (Borg & Gall, 1989), all data were considered to have met the necessary assumptions for multiple regression.

Part 1.c: Structure of Regression Analysis Tables

Tables in part 2 of Section E present multiple regression analyses for RQ7 and RQ8. For each of the 12 regression analyses there are two tables. The first table summarizes statistics produced at each step of the multiple regression. The second table describes the variables combined in the model selected for presentation, henceforward referred to as the preferred model. In both tables, the first column contains the step number and a description of the variable entered at that step. In the first table, the second column describes variables as either input (I), environmental (E), or output (O) per Astin's I-E-O model (1990).[14] In the first table, the third column presents the cumulative adjusted $\underline{R}^2$, and the fourth column presents change in adjusted $\underline{R}^2$ at each step. In the second table, the second, third, and fourth columns present the following statistics for each variable in the preferred model: unstandardized beta weights, standardized beta weights, and statistical significance.

Rows in the regression tables are ordered according to the step in which each variable entered the preferred model. Because of the large number of predictor variables in each of the equations, it was impractical to list them all in the tables. Thus, criterion for including a variable from the model in a table was set at .01 (1%)

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[14]Input variables were measured prior to fall 1996, outcomes during spring 1997; environmental variables were calculated by subtracting fall 1996 scores from spring 1997 scores. Astin (1990) placed particular emphasis on environmental variables "since the environment includes those things that the educator directly controls in order to develop the student's talents" (p. 18).

contribution to the adjusted R^2. (Variables that contributed less than .01 were occasionally included in a table if they preceded variables that added .01 or more to the adjusted R^2; in none of these cases was the contribution less than .007 or .7%.)[15] Even with the .01 inclusion criterion, the regression tables are still lengthy because noncomputer-related variables are included for context; for brevity's sake only computer-related variables in each model were reported.

Part 2.a: Relationship Between Microcomputer Use and Social Development: RQ7

The relationship between microcomputer use (in the context of selected variables) and the criterion variable freshman social development is examined in RQ7. The research question is, what relationship exists between microcomputer use and freshman social development? As presented in Table 31, there are three criterion factors: Faculty Interaction, Peer-Group Interaction, and Institutional Concern for Student Development (Pascarella & Terrenzini, 1980). The six analyses that relate to RQ7 are presented next.

Faculty Interaction. As noted in Table 31, variables hypothesized to relate to Faculty Interaction were analyzed in two groups: all variables and computer-related variables. Tables 33 and 34 present the results of the analysis using all variables, and Tables 35 and 36 present the results of the analysis using just computer-related variables.

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[15]Views differ as to whether this criterion (i.e., an increase of 1% or greater in R^2) is too lax or too stringent for determining the importance of predictor variables. Conventional interpretation in the social sciences relies on Cohen and Cohen (1983). Cohen and Cohen recommended that the criterion be 4%. On the other hand, Astin (1990), argued that in an assessment of higher education, even a contribution of less than 1% to R^2 can have a substantial influence on the criterion variable.

Table 33

Summary of Regression Steps with Contextual Plus Microcomputer Use Predictor Variables and Faculty Interaction as the Criterion Variable

Step	Variable entered in regression equation	I-E-O	Adjusted R^2	Change Adj. R^2
1	Involvement: Hours per week talking with teachers outside of class	O	.179	.179
2	Goal: Get advice on my goals: Satisfaction with progress toward completing this goal	O	.282	.103
3	Goal: Be confident about graduating, satisfaction with progress	O	.337	.038
4	Academic integration: Institutional and Goal Commitments, clear idea of intended major	I	.375	.021
5	Goal: Be involved in student activities, satisfaction with progress	O	.396	.013
6	Self-rating of creativity compared to average person same age	O	.409	.013
7	Social integration: Expectation that nonclassroom interactions with faculty will positively influence personal growth, values, and attitudes	I	.420	.011
8	Involvement: Estimate of hours per week to be spent exercising or doing sports	I	.428	.008
9[a]	Frequency: Change in hours per week using a computer for assignments	E	.441	.013
10	Goal: To develop helping skills, satisfaction with progress	O	.449	.008
11[a]	Computer confidence: "If I could call someone for help"	O	.456	.007
12[a]	Breadth: Spreadsheet skill, ability to enter data in a spreadsheet	O	.467	.011

[a] Computer-related variables.

Table 34

Coefficients for Preferred Model with Contextual Plus Microcomputer Use Predictor Variables and Criterion Variable Faculty Interaction

		Coefficients for Step 12		
Step	Variable entered in regression equation	B	β	Sig.
1	Involvement: Hours per week talking with teachers outside of class	.272	.387	.000
2	Goal: Get advice on my goals: Satisfaction with progress toward completing this goal	.086	.166	.002
3	Goal: Be confident about graduating, satisfaction with progress	.098	.173	.001
4	Academic integration: Institutional and Goal Commitments, clear idea of intended major	.092	.162	.001
5	Goal: Be involved in student activities, satisfaction with progress	.072	.125	.012
6	Self-rating of creativity compared to average person same age	.073	.115	.017
7	Social integration: Expectation that nonclassroom interactions with faculty will positively influence personal growth, values, and attitudes	.106	.116	.019
8	Involvement: Estimate of hours per week to be spent exercising or doing sports	-.058	-.149	.003
9[a]	Frequency: Hours per week using a computer for assignments	-.063	-.156	.002
10	Goal: To develop helping skills, satisfaction with progress	.073	.123	.027
11[a]	Computer confidence: "If I could call someone for help"	.034	.137	.007
12[a]	Breadth: Spreadsheet skill, ability to enter data in a spreadsheet	-.142	-.120	.019

[a] Computer-related variables.

Results in Table 33 show that the 12 predictor variables accounted for 46.7% of the variance in freshman perceptions of Faculty Interaction; this is a relationship of moderate magnitude (Cohen & Cohen, 1983), and leaves 53.3% of the variance unexplained. Using Astin's (1990) I-E-O model, there were three input (I), one environmental (E), and eight output (O) variables; this indicates that the perceptions of faculty being measured were largely a product of freshmen's first year experience. Three predictor variables (i.e., numbers 9, 11, and 12) were computer-related. The computer-related variable that entered the regression equation first and had the largest adjusted $\underline{R}^2$ was number 9, frequency: change in hours per week using a computer for assignments (β = -.160). The combined contribution of the three computer-related variables to the adjusted $\underline{R}^2$ was slightly more than 3%.

Results in Table 34 show that, of the three computer-related variables, one related positively and two negatively. The variable accompanied by more positive perceptions of Faculty Interaction was number 11, confidence when someone can be called for help (β = .137). The computer-related variables accompanied by more negative perceptions of Faculty Interaction were number 9, frequency: an increase over the year in the number of hours per week using a computer for assignments (β = -.160), and number 12, breadth: ability to enter data in a spreadsheet (β = -.120).

To explore the possibility that computer-related variables might account for a larger portion of the variance ($\underline{R}^2$) in the relationship between microcomputer use predictor variables and the criterion variable of perceptions of interaction with faculty, a stepwise multiple regression was performed in which computer-related variables were retained and all other variables were taken out of the regression equation. Tables 35 and 36 present the results of the analysis of computer-related variables.

Table 35

Summary of Regression Steps with Microcomputer Use Predictor Variables and Faculty Interaction as the Criterion Variable

Step	Variable entered into regression equation	I-E-O	Adjusted R^2	Change in Adj. R^2
1	Frequency: Hours per week using a computer for assignments, games, and communication	O	.054	.054
2	Breadth: Word processing skill, ability to produce a newsletter	I	.095	.041
3	Frequency: Estimate of hours per week using a computer for assignments	I	.118	.023
4	Breadth: Information retrieval skill, ability to send and receive e-mail	I	.131	.013

Table 36

Coefficients for Preferred Model with Microcomputer Use Predictor Variables and Faculty Interaction as the Criterion Variable

		Coefficients for Step 4		
Step/variable		B	β	Sig
1	Frequency: Hours per week using a computer for assignments, games, and communication	.056	.21	.000
2	Breadth: Word processing skill, ability to produce a newsletter	.254	.229	.000
3	Frequency: Estimate of hours per week using a computer for assignments	.100	.179	.000
4	Breadth: Information retrieval skill, ability to send and receive e-mail	-.139	-.124	.013

Results in Table 35 show that the combined influence of the four predictor variables accounted for 13.1% of the variance in Faculty Interaction. This is a relationship of weak magnitude (Cohen & Cohen, 1983) and leaves 86.9% of the variance unexplained. Using Astin's (1990) I-E-O model, there were three input and one output variable; this indicates that the perceptions of faculty being measured were largely determined prior to freshmen's first year. The variable that entered the regression equation first and had the largest adjusted $\underline{R}^2$ was (number 1) frequency: hours per week using a computer for assignments, games, and communication (β = .210).

Results in Table 36 show that three computer-related variables were positively and one negatively related to the criterion variable. The three variables accompanied by positive perceptions of Faculty Interaction were number 1 (named above); number 2, breadth: ability to produce a newsletter (β = .229); and number 3, frequency: estimate of the number of hours per week expected to use a microcomputer for assignments (β = .179). The variable accompanied by more negative perceptions of Faculty Interaction was number 4, breadth: ability to use e-mail prior to entering the university (β = -.124). Results in Table 36 also show that the first three variables in the regression equation were statistically significant at $\underline{p} < .01$.

When the two regression analyses performed on the criterion variable Faculty Interaction were compared, three observations were made: (a) Results using the I-E-O model differed, more output variables appeared when contextual variables were included, but when just computer-related variables were analyzed there were more input variables. (b) Computer-related variables representing the dimension of frequency of microcomputer use entered both regression equations first. (c) Four computer-related variables were accompanied by more positive perceptions and three

by more negative perceptions of Faculty Interaction. (A full summary of regression models describing the relationship between microcomputer use and freshman development is presented in Part 3 of Section E.)

Peer-Group Interaction. As noted in Table 31, predictor variables hypothesized to relate to Peer-Group Interaction were analyzed in two groups: all variables and computer-related variables. Tables 37 and 38 present the results of the analysis using all variables and Tables 39 and 40 present the results of the analysis using just computer-related variables.

Results in Table 37 show that the 15 predictor variables accounted for 35% of the variance in perceptions of Peer-Group Interaction. This is considered a relationship of moderate magnitude (Cohen & Cohen, 1983) and left 65% of the variance unexplained. Using Astin's (1990) I-E-O model, there were four input, one environmental, and 10 output variables; this indicates that perceptions of Peer-Group Interaction were largely determined as a product of freshmen's first year. Five predictor variables (i.e., numbers 4, 6, 9, 10, and 11) were computer-related. Combined, these five computer-related variables accounted for 7.3% of the total variance. Results in Table 37 also show that the computer-related variable that entered the regression equation first and had the largest adjusted R^2 was number 4, breadth: graphic skills, ability to use clip art prior to entering USU.

Results in Table 38 show that, of the five computer-related variables, three were positively related and two negatively related to the criterion variable. The three computer-related variables accompanied by more positive perceptions were number 6, frequency: hours spent playing computer games ($\beta = .171$); number 9, breadth: improvement in the ability to create functions for a database ($\beta = .150$); and number

Table 37

Summary of Regression Steps with Contextual Plus Microcomputer Use Predictor Variables and Peer-Group Interaction as the Criterion Variable

			Summary of steps	
Step	Variable entered in regression equation	I-E-O	Adjusted R^2	Change in Adj. R^2
1	Goal: Develop better self-understanding, satisfaction with progress on this goal	O	.141	.141
2	Goal: Learn to perform better under pressure, satisfaction with progress	O	.178	.037
3	Social integration: Peer interaction, expect to develop friendships that will be personally satisfying	I	.195	.017
4[a]	Breadth: Graphics skill, use clip art	I	.211	.016
5	Self-rating: Creativity compared to average person same age	O	.228	.017
6[a]	Frequency: Hours per week spent playing computer games	O	.241	.013
7	Gender	I	.255	.014
8	Social integration: Institutional concern, most faculty are interested in helping students grow in more than academic areas	I	.265	.010
9[a]	Breadth: Database skill, create functions for a database	E	.274	.009
10[a]	Computer confidence: "If I could call someone for help"	O	.291	.017
11[a]	Computer confidence: "If I had only the manual for reference"	O	.309	.018
12	Goal: Develop leadership skills: satisfaction with progress	O	.318	.009
13	Goal: Develop helping skills: satisfaction with progress	O	.328	.010
14	Goal: Be involved in student activities: satisfaction with progress on this goal	O	.339	.011
15	Self-rating of interpersonal ability	O	.35	.011

[a] Computer-related variables.

Table 38

Coefficients for Preferred Model with Contextual Plus Microcomputer Use Predictor Variables and Peer-Group Interaction as the Criterion Variable

		Coefficients for Step 15		
Step	Variable entered in the regression equation	B	β	Sig.
1	Goal: Develop better self-understanding, satisfaction with progress on this goal	.107	.246	.000
2	Goal: Learn to perform better under pressure, satisfaction with progress	.078	.162	.006
3	Social integration: Peer interaction, expect to develop friendships that will be personally satisfying	.138	.184	.001
4[a]	Breadth: Graphics skill, use clip art	-.164	-.213	.000
5	Self-rating: Creativity compared to average person same age	.092	.200	.001
6[a]	Frequency: Hours per week spent playing computer games	.070	.171	.002
7	Gender	-.089	-.109	.053
8	Social integration: Institutional concern, most faculty are interested in helping students grow in more than academic areas	-.077	-.118	.029
9[a]	Breadth: Database skill, create functions for a database	.115	.150	.006
10[a]	Computer confidence: "If I could call someone for help"	.051	.284	.000
11[a]	Computer confidence: "If I had only the manual for reference"	-.028	-.191	.008
12	Goal: Develop leadership skills: satisfaction with progress	-.085	-.215	.001
13	Goal: Develop helping skills: satisfaction with progress	.076	.176	.011
14	Goal: Be involved in student activities: satisfaction with progress on this goal	.066	.158	.011
15	Self-rating of interpersonal ability	-.054	-.132	.027

[a] Computer-related variables.

Table 39

Summary of Regression Steps with Microcomputer Use Predictor Variables and Peer-Group Interaction as the Criterion Variable

Step	Variable entered in the regression equation	I-E-O	Adjusted R^2	Change in Adj. R^2
1	Computer confidence: "If I could call someone for help"	O	.018	.018
2	Computer confidence: "If I had never used a package like it before"	O	.038	.020
3	Breadth: Word processing skill, produce a business letter	O	.049	.011
4	Breadth: Programming skill, debug a program	E	.061	.012

Table 40

Coefficients for Preferred Model with Microcomputer Use Predictor Variables and Peer-Group Interaction as the Criterion Variable

		Coefficients for Step 4		
Step	Variable entered in the regression equation	B	β	Sig.
1	Computer confidence: "If I could call someone for help"	.043	.233	.000
2	Computer confidence: "If I had never used a package like it before"	-.030	-.191	.002
3	Breadth: Word processing skill, produce a business letter	.136	.130	.015
4	Breadth: Programming skill, debug a program	.113	.121	.018

10, confidence in learning new software when someone could be called for help (β = .284). The two computer-related variables accompanied by more negative perceptions of Peer-Group Interaction were number 4 (named above) and number 11, confidence in learning new software when only the manual is available for reference (β = -.191). Also, results in Table 38 show that all of the computer-related variables were statistically significant at the $p < .01$ level.

To explore the possibility that computer-related variables might account for a larger portion of the variance in the relationship between microcomputer use predictor

variables and Peer-Group Interaction, a stepwise multiple regression was performed in which computer-related variables were retained and all other variables were taken out. Tables 39 and 40 present the results of the analysis of computer-related variables.

Results in Table 39 show that together the four predictor variables accounted for 6.1% of the variance in Peer-Group Interaction. This is a relationship of weak magnitude (Cohen & Cohen, 1983) and leaves 93.9% of the variance unexplained. Using Astin's (1990) I-E-O model, there were three output variables and one environmental; this indicates that the perceptions of peers being measured were largely a product of freshmen's first year. The computer-related variable that entered the regression equation first and had the largest adjusted $\underline{R}^2$ was (number 1) computer confidence when someone can be called for help ($\beta = .233$).

Results in Table 40 show that three computer-related variables were positively related and one was negatively related to the criterion variable. The three accompanied by positive perceptions of Peer-Group Interaction were number 1 (named above); number 3, breadth: the ability to produce a business letter ($\beta = .130$); and number 4, breadth: change in the ability to debug a program ($\beta = .121$). The variable accompanied by more negative perceptions of Peer-Group Interaction was number 2, confidence when a similar package had not been used before ($\beta = -.191$). Results in Table 40 also shows that the first two variables in the model were statistically significant at $\underline{p} < .01$.

When the two regression analyses performed on Peer-Group Interaction were compared, three observations were made: (a) Results using the I-E-O model showed the largest portion of variables in both analyses were outputs; (b) a computer-related variable representing the dimension of breadth was the first to enter the regression analysis that included all variables, and a variable representing depth (or computer

self-efficacy strength) was the first to enter the analysis that used just computer-related variables; and (c) six computer-related variables were accompanied by more positive perceptions and three by more negative perceptions of Peer-Group Interaction. (A full summary of regression models describing the relationship between microcomputer use and freshman development is presented in Part 3 of Section E.)

Institutional Concern for Student Development. As noted in Table 31, predictor variables hypothesized to relate to Institutional Concern for Student Development were analyzed in two groups: all variables and computer-related variables. Tables 41 and 42 present the results of the analysis using all variables and Tables 43 and 44 present the results of the analysis using just computer-related variables.

Results in Table 41 show that the 11 predictor variables accounted for 29.9% of the variance in perceptions of Institutional Concern for Student Development; this is an relationship of moderate magnitude (Cohen & Cohen, 1983) and leaves 70.1% of the variance unexplained. Using Astin's (1990) model, there were nine input and two output variables; this indicates that perceptions of Institutional Concern for Student Development were largely determined prior to freshmen's first year. Results in Table 41 also show that two predictor variables (i.e., 5 and 6) were computer-related, and that combined these computer-related variables accounted for 3.5% of the variance. The computer-related variable that entered the regression equation first was number 5, frequency: estimate of time to be spent playing computer games ($\beta = .138$). The computer-related variable that had the largest adjusted $\underline{R}^2$ was number 6, frequency: years of experience with a microcomputer ($\beta = -.168$).

Results in Table 42 show that of the computer-related variables, one was positively related and one negatively related to perceptions of Institutional Concern for Student Development. The computer-related variable accompanied by more positive

Table 41

Summary of Regression Steps with Contextual Plus Microcomputer Use Predictor Variables and Criterion Variable Institutional Concern for Student Development

Step	Variable entered in the regression equation	I-E-O	Adjusted R^2	Change in Adj. R^2
1	ACT English score	I	.123	.123
2	Goal: Develop better self-understanding: satisfaction with progress on this goal	O	.166	.043
3	Involvement: Doing volunteer work, estimate of hours per week to be spent	I	.187	.021
4	Social integration: Institutional concern, most faculty are interested in helping students grow in more than academic areas	I	.204	.017
5[a]	Frequency: Playing computer games, estimate of hours per week to be spent	I	.221	.017
6[a]	Frequency: Years of experience using a microcomputer	I	.239	.018
7	Goal to be confident about graduating: importance	I	.252	.013
8	Goal to improve communication with friends: importance	I	.266	.014
9	Highest education level of father	I	.277	.011
10	Working with friends on homework hours per week	O	.287	.010
11	ACT math score	I	.299	.012

[a] Computer-related variables.

Table 42

Coefficients for Preferred Model with Contextual Plus Microcomputer Use Predictor Variables and Criterion Variable Institutional Concern for Student Development

		Coefficients for Step 11		
Step	Variable entered in regression equation	B	β	Sig.
1	ACT English score	-.057	-.476	.000
2	Goal: Develop better self-understanding: satisfaction with progress on this goal	-.110	-.171	.002
3	Involvement: Doing volunteer work, estimate of hours per week to be spent	-.063	-.149	.009
4	Social integration: Institutional concern, most faculty are interested in helping students grow in more than academic areas	-.173	-.179	.002
5[a]	Frequency: Playing computer games, estimate of hours per week to be spent	.089	.138	.015
6[a]	Frequency: Years of experience using a microcomputer	-.040	-.168	.003
7	Goal to be confident about graduating: importance	-.138	-.208	.001
8	Goal to improve communication with friends: importance	.110	.165	.014
9	Highest education level of father	.072	.132	.017
10	Working with friends on homework hours per week	.058	.124	.027
11	ACT Math score	-.020	.164	.027

[a] Computer-related variables.

Table 43

Summary of Regression Steps with Microcomputer Use Predictor Variables and Institutional Concern for Student Development as the Criterion Variable

Step	Variable entered in regression equation	I-E-O	Adjusted R^2	Change in Adj. R^2
1	Frequency: Total USU microcomputer lab entries for the freshman year 1996-1997	O	.033	.033
2	Frequency: Microcomputer use in year prior to entering USU	I	.055	.022
3	Frequency: Playing computer games, estimate of hours per week to be spent	I	.077	.022
4	Breadth: Database skill, create function for a database	I	.087	.010
5	Computer confidence: "If someone showed me how to do it first"	O	.098	.011

Table 44

Coefficients for Preferred Model with Microcomputer Use Predictor Variables and Institutional Concern for Student Development as the Criterion Variable

		Coefficients for Step 5		
Step	Variable entered in regression equation	B	β	Sig.
1	Frequency: Total USU microcomputer lab entries for the freshman year 1996-1997	-.001	-.148	.003
2	Frequency: Microcomputer use in year prior to entering USU	-.211	-.180	0
3	Frequency: Playing computer games, estimate of hours per week to be spent	.103	.148	.003
4	Breadth: Database skill, create functions for a database	.226	.135	.009
5	Computer confidence: "If someone showed me how to do it first"	-.040	-.120	.018

perceptions of Institutional Concern for Student Development was number 5 (named above), and the variable accompanied by more negative perceptions was number 6 (also described above). Results in Table 42 also show that the first four variables and variables numbers 6 and 7 were statistically significant at $p < .01$.

To explore the possibility that computer-related variables might account for a larger portion of the variance in the relationship between predictor variables representing microcomputer use and the criterion variable representing perceptions of Institutional Concern for Student Development, a stepwise multiple regression was performed in which computer-related variables were retained and all others were taken out of the regression equation. Tables 43 and 44 present the results of the analysis using just the computer-related predictor variables.

Results in Table 43 show that combined the five predictor variables accounted for 9.8% of the variance in Institutional Concern for Student Development. This is a relationship of weak magnitude (Cohen & Cohen, 1983) and leaves 90.2% of the variance unexplained. Using Astin's (1990) model, there were three input and two

output variables; this indicates that perceptions of institutional concern are largely determined prior to entering USU. Results in Table 43 also show that the computer-related variable that entered the regression equation first and had the largest adjusted R^2 was (number 1) frequency: total microcomputer lab use for the year ($\beta = -.148$).

Results in Table 44 show that two variables are positively related and three are negatively related to the criterion variable. The two variables accompanied by positive perceptions of Institutional Concern for Student Development were number 3, frequency: estimate of time to be spent playing computer games ($\beta = .148$), and number 4, breadth: ability to create functions for a database. The three variables accompanied by more negative perceptions of Institutional Concern for Student Development were number 1 (named above); number 2, frequency: use of microcomputers prior to entering the university ($\beta = -.180$); and number 5, confidence in learning new software when someone could show the freshman how to do it first ($\beta = -.120$) . Results in Table 44 also show that the first four variables entered into the analysis are statistically significant at $p < .01$.

When the two regression analyses performed on Institutional Concern for Student Development were compared, three observations were made.

1. Results using the I-E-O model showed the largest portion of variables in both analyses were inputs.

2. Computer-related variables representing the dimension of frequency were the first to enter both regression analyses.

3. Three computer-related variables were accompanied by more positive perceptions and four by more negative perceptions of the criterion variable. (A full summary of regression models describing the relationship between microcomputer use and freshman development is presented in Part 3 of Section E.)

Summary of Main Results for RQ7

Perceptions of Faculty Interaction most closely correlated to the number of hours per week that freshmen used microcomputers (see Tables 33-36) . Perceptions of Peer-Group Interaction most closely correlated to computer self-efficacy (see Tables 37-40). Perceptions of Institutional Concern for Student Development most closely correlated to long-term involvement with microcomputers, which included the frequency of microcomputer use prior to entering the university and during their first academic year (see Tables 41-44).

Part 2.b: Relationship of Microcomputer Use and Other Variables on Intellectual Development, RQ8

The relationship between microcomputer use (in the context of selected variables) and the criterion variable freshman intellectual development is examined in RQ8. The research question is what relationship exists between microcomputer use and freshman intellectual development? As presented in Table 31, there are three criterion variables: two factors from Pascarella and Terrenzini (1980), Academic and Intellectual Development and Institutional and Goal Commitment, and the conventional measure of intellectual development, cumulative GPA. The six analyses from Table 31 that relate to RQ8 are presented next.

Academic and Intellectual Development. As noted in Table 31, predictor variables hypothesized to relate to Academic and Intellectual Development were analyzed in two groups: all variables and computer-related variables. Tables 45 and 46 present the results of the analysis using all variables, and Tables 47 and 48 present the results of the analysis using just computer-related variables.

Table 45

Summary of Regression Steps with Contextual Plus Microcomputer Use Predictor Variables and Academic and Intellectual Development as the Criterion Variable

Step	Variable entered in regression equation	I-E-O	Adjusted R^2	Change in Adj. R^2
1	Goal: Develop helping skills, satisfaction with progress	O	.182	.182
2	Goal: Improve study skills, satisfaction with progress	O	.273	.091
3	Cumulative GPA Spring Quarter 1997	O	.341	.068
4	Social integration: Institutional concern for student development, "Most faculty members are interested in teaching"	I	.378	.037
5	Goal: Importance of exploring potential jobs and careers	I	.405	.027
6[a]	Breadth: Number of software packages used during a microcomputer session	O	.414	.009
7[a]	Breadth: Word processing skill, produce a résumé	I	.426	.012
8	Involvement: Hours per week spent exercising or doing sports	O	.436	.010
9	Class rank as of spring quarter 1997	O	.447	.011
10	Involvement: Volunteer work, estimate of hours/week to be spent	I	.457	.010
11[a]	Breadth: Basic skill, copy a file	I	.467	.010

[a] Computer-related variables.

Table 46

Coefficients for Preferred Model with Contextual Plus Microcomputer Use Predictor Variables and Academic and Intellectual Development as the Criterion Variable

		Coefficients for Step 11		
Step	Variable entered in regression equation	B	β	Sig.
1	Goal: Develop helping skills, satisfaction with progress	.148	.281	.000
2	Goal: Improve study skills, satisfaction with progress	.122	.230	.000
3	Cumulative GPA Spring Quarter 1997	.180	.233	.000
4	Social integration: Institutional concern for student development, "Most faculty members are interested in teaching"	.124	.164	.001
5	Goal: Importance of exploring potential jobs and careers	.078	.158	.002
6[a]	Breadth: Number of software packages used during a microcomputer session	-.052	-.103	.041
7[a]	Breadth: Word processing skill, produce a résumé	.160	.152	.002
8	Involvement: Hours per week spent exercising or doing sports	.046	.130	.007
9	Class rank as of spring quarter 1997	.121	.142	.006
10	Involvement: Volunteer work, estimate of hours per week to be spent	-.041	-.115	.019
11[a]	Breadth: Basic skill, copy a file	-.125	-.117	.020

[a] Computer-related variables

Table 47

Summary of Regression Steps with Microcomputer Use Predictor Variables and Academic and Intellectual Development as the Criterion Variable

Step	Variable entered in regression equation	I-E-O	Adjusted R^2	Change in Adj. R^2
1	Breadth: Word processing skill, produce a résumé	I	.019	.019
2	Frequency: Estimate of hours per week to be spent playing computer games	I	.035	.016
3	Breadth: Basic skill, change in ability to make a copy of a file	E	.049	.014
4	Computer confidence: "If someone showed me how to do it first"	I	.064	.015
5	Breadth: Basic skill, save a document to a disk	O	.079	.015
6	Frequency: Microcomputer ownership while at USU	O	.089	.010
7	Breadth: Programming skill, write a program in code	O	.101	.012

Table 48

Coefficients for Preferred Model with Microcomputer Use Predictor Variables and Academic and Intellectual Development as the Criterion Variable

		Coefficients for Step 4		
Step	Variable entered in regression equation	B	β	Sig.
1	Breadth: Word processing skill, produce a résumé	.174	.163	.002
2	Frequency: Estimate of hours per week to be spent playing computer games	-.075	-.130	.009
3	Breadth: Basic skill, change in ability to make a copy of a file	-.189	-.191	.000
4	Computer confidence: "If someone showed me how to do it first"	.036	.142	.006
5	Breadth: Basic skill, save a document to a disk	-.500	-.151	.003
6	Frequency: Microcomputer ownership while at USU	.103	.131	.014
7	Breadth: Programming skill, write a program in code	-.168	-.124	.015

Results in Table 45 show that the 11 predictor variables accounted for 46.7% of the variance in Academic and Intellectual Development; this is a relationship of moderate magnitude (Cohen & Cohen, 1983) and leaves 53.3% of the variance unexplained. Using Astin's (1990) I-E-O, there were four inputs and six output variables; this indicates that perceptions of Academic and Intellectual Development were the product of freshmen's first year. Results in Table 45 also show that three predictor variables (i.e., numbers 6, 7, and 11) were computer related. Together they accounted for 3.1% of the variance. The computer-related variable that entered the regression analysis first was number 6, breadth: using more software packages during a session at the microcomputer ($\beta = -.103$), and the computer-related variable that accounted for the largest percentage of variance was number 7, breadth: the ability to produce a résumé ($\beta = .152$).

Results in Table 46 show that, of the three computer-related variables, one was positively related and two negatively related to the criterion variable. The computer-related variable accompanied by more positive perceptions of academic and intellectual development was number 7 (named above). The computer-related variables accompanied by more negative perceptions were number 6 (named above) and number 11, breadth: the ability to copy a file prior to entering USU (β = -.117). Results in Table 46 also show that seven of the variables presented in the table were statistically significant at $p < .01$.

To explore the possibility that computer-related variables might account for a larger portion of the variance in the relationship being researched (i.e., between microcomputer use and perceptions of academic and intellectual development), a stepwise multiple regression was performed in which computer-related variables were retained and all others were taken out of the regression equation. Tables 47 and 48 present the results of this analysis using just computer-related variables.

Results in Table 47 show that the combined influence of the seven predictor variables accounted for 10.1% of the variance in perceptions of academic and intellectual development. This is a weak relationship (Cohen & Cohen, 1983) and leaves 89.9% of the variance unexplained. Using Astin's (1990) I-E-O model, there were three input, one environmental, and three output variables; this indicates that freshman perceptions of academic and intellectual development were determined both prior to entry and as product of the first year. Seven computer-related, predictor variables were in the preferred model. The computer-related variable that entered the regression equation first and that had the largest R^2 was (number 1) breadth: the pre-entry ability to produce a résumé (β = .163).

Results in Table 48 show that of the seven computer-related variables, three were positively related and four were negatively related to the criterion variable. The three variables accompanied by positive perceptions of academic and intellectual development were number 1 (named above); number 4, confidence when someone can demonstrate ($\beta = .142$); and number 6, frequency: owning a microcomputer while attending USU ($\beta = .131$). The four computer-related variables accompanied by negative perceptions were number 2, frequency: estimate of hours per week to be spent playing computer games ($\beta = -.130$); number 3, breadth: change in the ability to make a copy of a file during a student's first year ($\beta = -.191$); number 5, breadth: ability to save a document to a disk ($\beta = -.151$); and number 7, breadth: ability to write a program in code ($\beta = -.124$). Results in Table 48 also show that the first five variables in the model were statistically significant at $\underline{p} < .01$.

When the two regression analyses performed on academic and intellectual development were compared, three observations were made: (a) results using the I-E-O model indicated that freshman perceptions of academic and intellectual development were determined both prior to entry and as product of their first year; (b) computer-related variables representing the dimension of breadth were the first to enter both regression analyses; and (c) four computer-related variables were accompanied by more positive perceptions and six by more negative perceptions of the criterion variable. (A full summary of regression models describing the relationship between microcomputer use and freshman development is presented in Part 3 of Section E.)

Institutional and Goal Commitment. As noted in Table 31, predictor variables hypothesized to relate to Peer-Group Interaction were analyzed in two groups: all variables and computer-related variables. Tables 49 and 50 present the results of the

Table 49

Summary of Regression Steps with Contextual Plus Microcomputer Use Predictor Variables and Institutional and Goal Commitment as the Criterion Variable

Step	Variable entered in regression equation	I-E-O	Adjusted R^2	Change in Adj. R^2
1	Gender	I	.107	.107
2	Academic integration: Institutional and goal commitment, "It is important for me to graduate from USU"	I	.195	.091
3	Goal: Develop money management skills, difference between importance and satisfaction	E	.261	.066
4	Goal: Learn to perform better under pressure: satisfaction with progress	O	.288	.027
5[a]	Breadth: Basic skill, save a document to disk	I	.307	.019
6[a]	Breadth: Information retrieval skill, use an electronic bulletin board	I	.325	.018
7	Goal: Improve communication with friends, difference between importance and satisfaction	E	.34	.015
8	Cumulative GPA Spring Quarter 1997	O	.354	.014
9	ACT English score	I	.367	.013
10[a]	Computer confidence: "If someone had helped me get started" change during 1996-97 year	E	.379	.012
11	Highest Education level of mother	I	.388	.009
12[a]	Frequency: Use of computer for assignments, change in number of hours per week first year	E	.398	.010
13	Involvement: Estimate of hours per week to be spent exercising or doing sports	I	.412	.014

[a] Computer-related variables.

Table 50

Coefficients for Preferred Model with Contextual Plus Microcomputer Use Predictor Variables and Institutional and Goal Commitment as the Criterion Variable

		Coefficients for Step 13		
Step	Variable entered in regression equation	B	β	Sig.
1	Gender	-.412	-.320	.000
2	Academic integration: Institutional and goal commitment, "It is important for me to graduate from USU"	.270	.327	.000
3	Goal: Develop money management skills, difference between importance and satisfaction	-.087	-.190	.001
4	Goal: Learn to perform better under pressure: satisfaction with progress	.112	.148	.004
5[a]	Breadth: Basic skill, save a document to disk	.393	.166	.001
6[a]	Breadth: Information retrieval skill, use an electronic bulletin board	-.237	-.180	.001
7	Goal: Improve communication with friends, difference between importance and satisfaction	-.084	-.150	.005
8	Cumulative GPA Spring Quarter 1997	.208	.211	.001
9	ACT English score	-.022	-.17	.006
10[a]	Computer confidence: "If someone had helped me get started" change during 1996-97 year	.141	.141	.005
11	Highest Education level of mother	.115	.115	.024
12[a]	Frequency: Use of computer for assignments, change in number of hours per week first year	-.137	-.140	.008
13	Involvement: Estimate of hours per week to be spent exercising or doing sports	-.132	-.130	.011

[a] Computer-related variables.

analysis using all variables; Tables 51 and 52 present the results of the analysis using just computer-related variables.

Results in Table 49 show that the combined influence of the 13 predictor variables accounted for 41.2% of the variance in freshman Institutional and Goal Commitment; this is a relationship of moderate magnitude (Cohen & Cohen, 1983) and leaves 58.8% of the variance unexplained. Using Astin's (1990) I-E-O model, there are seven input, four environmental, and two output variables; this indicates that Institutional and Goal Commitment were largely determined prior to entering USU. Four predictor variables (i.e., numbers 5, 6, 10, and 12) were computer-related. The combined contribution of the four computer-related variables to the adjusted $\underline{R}^2$ was 5.9%. The computer-related variable that entered the regression equation first and that had the largest $\underline{R}^2$ was number 5, breadth: the ability to save a document to a disk ($\beta = .166$).

Results in Table 50 show that two of the computer-related variables were positively related and two negatively related to the criterion variable. The computer-related variables accompanied by more positive Institutional and Goal Commitment were number 5 (named above); and number 10, confidence prior to entering the university "if someone helped me get started" ($\beta = .141$). The computer-related variables accompanied by more negative Institutional and Goal Commitment were number 6, an increase in the number of hours per week spent using a computer for assignments ($\beta = -.140$); and number 12, an ability to use an electronic bulletin board ($\beta = -.180$). Results in Table 50 also show that 12 of the predictor variables in this multiple regression analysis were significant at $\underline{p} < .01$.

To explore the possibility that computer-related variables might account for a larger portion of the variance in the relationship being researched (i.e., between

Table 51

Summary of Regression Steps with Microcomputer Use Predictor Variables and Institutional and Goal Commitment as the Criterion Variable

Step	Variable entered in regression equation	I-E-O	Adjusted R^2	Change in Adj. R^2
1	Breadth: Information retrieval skill, use an electronic bulletin board	O	.041	.041
2	Computer confidence: "If I had used similar packages before"	I	.061	.020
3	Breadth: Basic skill, change in ability to make a copy of a file during year	E	.075	.014
4	Frequency: Hours per week playing computer games	O	.089	.014
5	Breadth: Basic skill, use Windows operating system	I	.105	.016
6	Frequency: Hours per week using a computer to talk to friends and family	O	.115	.010

Table 52

Coefficients for Preferred Model with Microcomputer Use Predictor Variables and Institutional and Goal Commitment as the Criterion Variable

		Coefficients for Step 6		
Step	Variable entered in regression equation	B	β	Sig.
1	Breadth: Information retrieval skill, use an electronic bulletin board	-.274	-.216	.000
2	Computer confidence: "If I had used similar packages before"	.044	.143	.000
3	Breadth: Basic skill, change in ability to make a copy of a file during year	-.165	-.141	.005
4	Frequency: Hours per week playing computer games	-.102	-.156	.002
5	Breadth: Basic skill, use Windows operating system	.269	.140	.006
6	Frequency: Hours per week using a computer to talk to friends and family	.055	.112	.027

microcomputer use and Institutional and Goal Commitment), a stepwise multiple regression was performed in which computer-related variables were retained and all others were taken out of the regression equation. Tables 51 and 52 present the results of the analysis using just computer-related variables.

Results in Table 51 show that the combined influence of the six predictor variables accounted for 11.5% of the variance in Institutional and Goal Commitment. This is a relationship of weak magnitude (Cohen & Cohen, 1983) and leaves 88.5% of the variance unexplained. Using Astin's (1990) I-E-O model, there are two input, one environmental, and three output variables; this indicates that Institutional and Goal Commitment was determined both prior to entry and as a product of freshmen's first year. The computer-related variable that entered the regression equation first and that had the largest $\underline{R}^2$ was the ability to use an electronic bulletin board (β = -.216), which represents the breadth dimension of microcomputer use.

Results in Table 52 show that three computer-related variables were positively related and three were negatively related to the criterion variable. The three variables accompanied by positive Institutional and Goal Commitment were number 2, confidence in learning new software when similar packages have been used before (β = .143); number 5, the ability to use Windows operating system (β = .140); and number 6, using a computer to talk to friends and family and to make new friends (β = .112). The three variables accompanied by more negative Institutional and Goal Commitment were number 1 (named above); number 3, change in the ability to make a copy of a file during a the first year at USU (β = -.141); and number 4, spending more hours per week playing computer games (β = -.156). Results in Table 52 also show that five of the six predictor variables in this multiple regression analysis are significant at $\underline{p} < .01$.

When the two regression analyses performed on Institutional and Goal Commitment were compared, three observations were made: (a) results using the I-E-O model indicated that freshman perceptions of academic and intellectual development were determined both prior to entry and as product of their first year; (b) computer-related variables representing the dimension of breadth were the first to enter both regression analyses; and (c) five computer-related variables were accompanied by more positive perceptions and five by more negative perceptions of the criterion variable. (A full summary of regression models describing the relationship between microcomputer use and freshman development is presented in Part 3 of Section E.)

Spring USU GPA. As noted in Table 31, predictor variables hypothesized to relate to Spring USU GPA were analyzed in two groups: all variables and computer-related variables. Tables 53 and 54 present the results of the analysis using all variables and Tables 55 and 56 present the results of the analysis using just computer-related variables.

Results in Table 53 show that the 12 predictor variables accounted for 65.3% of the variance. This is a relationship of strong magnitude (Cohen & Cohen, 1983) and leaves 34.7% of the variance unexplained. Using Astin's (1990) I-E-O model, there were two inputs, four environmental, and five output variables; this indicates that spring USU GPA is largely a product of freshmen's first-year experience. Two predictor variables (i.e., numbers 8 and 12) were computer related. The combined contribution of the two computer-related variables to variance in spring USU GPA was 1.9%. The computer-related variable that entered the regression equation first and had the largest R^2 was number 8, change in the ability to retrieve information over the Internet (β = -.135), which represents the breadth dimension of microcomputer use.

Table 53

Summary of Regression Steps with Contextual Plus Microcomputer Use Predictor Variables and Spring USU GPA as the Criterion Variable

Step	Variable entered in regression equation	I-E-O	Adjusted R^2	Change in Adj. R^2
1	Self-rating of academic ability spring	O	.394	.394
2	Cumulative credit hours through spring quarter 1997	O	.482	.088
3	ACT English scores	I	.537	.055
4	Academic integration: academic and intellectual development, "I have performed academically as well as I anticipated"	O	.566	.029
5	Involvement: Hours per week spent studying or doing homework by myself	O	.585	.019
6	Self-rating of writing ability	O	.598	.032
7	Goal: Make potential business contacts, difference between importance and satisfaction	E	.608	.01
8[a]	Breadth: Information retrieval skill, change in ability to retrieve information over the Internet during 1996-97 academic year	E	.617	.009
9	Goal: Explore potential jobs and careers, difference between importance and satisfaction	E	.626	.009
10	Academic integration: Institutional and goal commitment: "I have a clear idea about what I intend to major in"	I	.635	.009
11	Goal: Develop helping skills, difference between importance and satisfaction	E	.643	.008
12[a]	Frequency of microcomputer use prior to entering USU	I	.653	.01

[a] Computer-related variables.

Table 54

Coefficients for Preferred Model with Contextual Plus Microcomputer Use Predictor Variables and Spring USU GPA as the Criterion Variable

		Coefficients for Step 12		
Step	Variable entered in regression equation	B	β	Sig.
1	Self-rating of academic ability spring	.229	.293	.000
2	Cumulative credit hours through spring quarter 1997	.006	.222	.000
3	ACT English scores	.038	.298	.000
4	Academic integration: academic and intellectual development, "I have performed academically as well as I anticipated"	.140	.172	.000
5	Involvement: Hours per week spent studying or doing homework by myself	.075	.157	.000
6	Self-rating of writing ability	-.096	-.144	.001
7	Goal: Make potential business contacts, difference between importance and satisfaction	.059	.127	.002
‡8	Breadth: Information retrieval skill, change in ability to retrieve information over the Internet	-.156	-.135	.001
9	Goal: Explore potential jobs and careers, difference between importance and satisfaction	-.078	-.148	.001
10	Academic integration: Institutional and goal commitment: "I have a clear idea about what I intend to major in"	-0.77	-.116	.003
11	Goal: Develop helping skills, difference between importance and satisfaction	.068	.113	.005
12[a]	Frequency of microcomputer use prior to entering USU	.142	.115	.006

[a] Computer-related variables.

Table 55

Summary of Regression Steps with Microcomputer Use Predictor Variables and Spring USU GPA as the Criterion Variable

Step	Variable entered in regression equation	I-E-O	Adjusted R^2	Change in Adj. R^2
1	Frequency: Total USU microcomputer lab entries for the year	O	.045	.045
2	Breadth: Database skill, change in ability to enter data into an existing database during 1996-97	E	.077	.032
3	Frequency of microcomputer use in year prior to entering USU	I	.105	.028
4	Breadth: Information retrieval skill, change in ability during year	E	.138	.033
5	Breadth: Word processing skill, change in ability to use mail merge for form letters during year 1996-97	E	.152	.014
6	Frequency: Computer ownership	O	.169	.017

Table 56

Coefficients for Preferred Model with Microcomputer Use Predictor Variables and Spring USU GPA as the Criterion Variable

		Coefficients for Step 6		
Step	Variable entered in regression equation	B	β	Sig.
1	Frequency: Total USU microcomputer lab entries for the year	.002	.186	.002
2	Breadth: Database skill, change in ability to enter data into an existing database during 1996-97	-.158	-.151	.012
3	Frequency of microcomputer use in year prior to entering USU	.270	.216	.000
4	Breadth: Information retrieval skill, change in ability during year	-.265	-.227	.000
5	Breadth: Word processing skill, change in ability to use mail merge for form letters during year 1996-97	.191	.146	.012
6	Frequency: Computer ownership	.195	.150	.014

Results in Table 54 show that one of the computer-related variables was positively related and one negatively related to the criterion variable. The computer-related variable accompanied by positive change in Spring USU GPA was number 12, frequency of microcomputer use prior to entering the university ($\beta = .115$). The computer-related variable accompanied by negative change in Spring USU GPA was number 8 (named above). Results in Table 54 also show that all of the 12 predictor variables in this multiple regression analysis are significant at $p < .01$.

To explore the possibility that computer-related variables might account for a larger portion of the variance in the relationship being researched (i.e., between microcomputer use and Spring USU GPA), a stepwise multiple regression was performed in which computer-related variables were retained and all others were taken out of the regression equation. Tables 55 and 56 present the results of the analysis using just computer-related variables.

Results in Table 55 show that the combined influence of the six predictor variables accounted for about 17% of the variance in Spring USU GPA. This is a relationship of weak magnitude (Cohen & Cohen, 1983) and leaves 83% of the variance unexplained. Using Astin's (1990) I-E-O model, there were one input, three environmental, and two output variables, this indicates that Spring USU GPA is largely influenced by environmental variables. The computer-related variable that entered the regression equation first and that had the largest R^2 was (number 1) total USU microcomputer lab entries for the year ($\beta = .186$), which represents the frequency dimension of microcomputer use.

Results in Table 56 show four predictor variables were positively related and two were negatively related to the criterion variable. The four variables accompanied by positive change in Spring USU GPA were number 1 (named above); number 3,

frequency of microcomputer use prior to entering the university (β = .216); number 5, change in the ability to use mail merge for form letters (β = .146); and number 6, microcomputer ownership while attending USU (β = .150). The variables accompanied by negative change in Spring USU GPA were number 2, improvement in the ability to enter data in an existing database (β = -.158); and number 4, change in the ability to use the Internet to retrieve information (β = -.227). Results in Table 56 also show that three of the six predictor variables in this multiple regression analysis are significant at $p < .01$.

When the two regression analyses performed on Spring USU GPA were compared, three observations were made: (a) results using the I-E-O model indicated that Spring USU GPA was affected by environmental variables and as product of the first year; (b) computer-related variables representing the dimensions of breadth and frequency were first to enter both regression analyses; and (c) five computer-related variables were accompanied by positive change and three by negative change in the criterion variable. (A full summary of regression models describing the relationship between microcomputer use and freshman development is presented in Part 3 of Section E.)

Summary of Results for RQ8

Perceptions of academic and intellectual development most closely correlated to the breadth dimension of microcomputer use and variables such as the number of software typically used during a microcomputer session and the ability to produce a résumé prior to entering the university (see Tables 48-51). Institutional and goal commitments also correlated to variables representing the breadth dimension of microcomputer use, in particular information retrieval skills (see Tables 52, 53, 54, and

55). Spring USU GPA was related to the frequency dimension of microcomputer use and variables such as students' long-term involvement with microcomputers, which includes the frequency of microcomputer use prior to entering the university and during their first academic year (see Tables 57- 60).

Part 3: Synthesis of 12 Regression Analyses

In this synthesis of the regression analyses, six tables are presented that summarize the two regression models that were produced for each of the six criterion variables: Table 57 summarizes the I-E-O classification.[16] Table 58 summarizes the dimension and computer-related variables that entered the regression model first. Table 59 summarizes the percentage of variance associated with computer-related predictor variables in each of the regression analyses. Table 60 summarizes results presented in Tables 58 and 59. Table 61 summarizes positive and negative beta weights for variables relating to freshman social and intellectual development. Table 62 lists the variables that represented the predominant dimensions related to the criterion variables.

I-E-O classification of the variables are summarized in Table 57 for each of the 12 preferred models produced in Part 2. The purpose of this synthesis was to determine for each criterion variable whether input, output, or environmental variables had the most influence.

Results in Table 57 show that the pattern of I-E-O variables is similar for the analyses using just computer-related variables and the analyses using all variables. Summing the results for the analyses of social development factors shows that the

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[16]Measurement prior to entering USU equals I, during spring quarter equals O, or during the school year equals E.

Table 57

Comparison of I-E-O Characteristics of Variables for Regression Models

	Models with all variables (contextual and computer-related)			Models with just computer-related variables		
Criterion Variable	I	E	O	I	E	O
RQ7: Social development analyses						
Factor 1: Faculty Interaction	3	1	8	3	0	1
Factor 2: Peer Interaction	4	1	10	0	1	3
Factor 3: Institutional Concern	9	0	2	3	0	2
Total for RQ7	16	2	20	6	1	6
RQ8: Intellectual development analyses						
Factor 1: Academic Development	5	0	6	3	1	3
Factor 2: Institutional Commitment	7	4	2	2	1	3
Factor 3: Spring USU GPA	3	4	5	1	3	2
Total for RQ8	15	8	13	6	5	8

Table 58

Comparison of Models by Computer-Related Variables with Greatest Change in R^2

Criterion variable	Models with All (Contextual and Computer-related) Variables	Models with Just Computer-Related Predictor Variables
RQ7: Social Development Analyses		
Factor 1: Faculty Interaction	Frequency: Change in hours per week using a computer for assignments (E)	Frequency: Hours per week using a computer (O)
Factor 2: Peer Interaction	Breadth: Graphics skill, use clip art prior to entering (I)	Computer confidence: "If I could call someone for help" (O)
Factor 3: Institutional Concern	Frequency: Estimate of hours per week to be spent playing computer games (I)	Frequency: Total USU microcomputer lab entries for the year (O)
RQ8: Intellectual Development Analyses		
Factor 1: Academic Development	Breadth: Number of software packages usually used during a microcomputer session (O)	Breadth: Word processing skill, produce a rèsumè (I)
Factor 2: Institutional Commitment	Breadth: Basic skill, save a document to a disk (I)	Breadth: Information retrieval skill, use an electronic bulletin board (O)
Factor 3: Spring USU GPA	Breadth: Information retrieval skill, change in ability to retrieve information over the Internet (E)	Frequency: Total USU microcomputer lab entries for the year (O)

Table 59

Comparison of Models by Percentage of Variance Accounted For Within Dimensions of Microcomputer Use

	Models with all (contextual and computer-related) variables			Models with just computer-related variables		
Criterion variable	% Frequency	% Breadth	% C-SE	% Frequency	% Breadth	% C-SE
RQ7: Social development analyses						
Factor 1: Faculty Interaction	1.3	1.1	.7	5.4, 2.3	4.1, 1.3	
Factor 2: Peer Interaction	1.3	1.6, .9	1.7, 1.8		1.1, 1.2	1.8, 2
Factor 3: Institutional Concern	1.7, 1.8			3.3, 2.2, 2.2	1	1.1
Count for RQ7	4	3	3	5	5	3
RQ8: Intellectual development analyses						
Factor 1: Academic Development		.9, 1.2, 1		1.6, 1	1.9, 1.4, 1.5, 1.2	1.5
Factor 2: Institutional Commitment	1	1.9, 1.8,	1.2	1.4, 1	4.1, 1.4, 1.6	2.
Factor 3: Spring USU GPA	1	.9		4.5, 2.8, 1.7	3.2, 3.3, 1.4	
Count for RQ8	2	6	1	7	10	2
Total count of variables	7	9	4	12	15	5

Note. Because changes in R^2 produced by variables take place in a series of steps in the regression analysis, the values listed in each cell cannot logically be summed to a total but represent magnitude of relationship and frequency of interaction.

Table 60

Dimensions of Microcomputer Use Related to Development

Criterion variable	Variable entered model first (Table 58)	Largest number and greatest R^2 (Table 59)
RQ7: Social development analyses		
Factor 1: Faculty Interaction	Frequency	Frequency
Factor 2: Peer Interaction	Breadth	Depth
Factor 3: Institutional Concern	Frequency	Frequency
RQ8: Intellectual development analyses		
Factor 1: Academic Development	Breadth	Breadth
Factor 2: Institutional Commitment	Breadth	Breadth
Factor 3: Spring USU GPA	Frequency and Breadth	Frequency and Breadth

influence was nearly equally shared by input and output variables; this indicates that social development is determined by freshmen's experience prior to entering USU and as a result of their first year. Summing the results for the analyses of intellectual development factors shows that the influence was nearly equally shared by input, environmental, and output variables. This indicates that intellectual development is determined throughout by freshmen's experience; prior to entering USU, during their first year, and as a result of their first year. It is noteworthy, that Spring USU GPA is the only instance where environmental variables had a major influence in both analyses. This indicates that Spring USU GPA might be considered as the best representation of variables that educators directly control (Astin, 1990).

The computer-related variables that entered each regression equation first are compared in Table 58. The purpose of this synthesis was to accentuate microcomputer use dimensions and investigate how they related to the dimensions of freshman development.

Results in Table 58 show that by examining computer-related variables according to the microcomputer use dimension they represent (i.e, frequency, breadth, or computer self-efficacy, see Figure 2) generalizations can be made about the relationship between microcomputer use and freshman development. In four of the six analyses of freshman social development, the variables that entered the regression equation first represented the frequency dimension of microcomputer use. Similarly, in five of the six analyses of freshman intellectual development, the variables that entered the regression evaluation first represented the breadth dimension of microcomputer use.

Results in Table 59 summarize the 12 preferred models produced in the regression analyses for RQ7 and RQ8 and show the percent of variance associated with each computer-related predictor variable (change in $\underline{R}^2$ multiplied by 100). The purpose of this comparison is the same as the previous one, to investigate how dimensions of microcomputer use are related to dimensions of freshman development.

Results in Table 59 summarize those microcomputer use dimensions which most often occurred and which accounted for the largest percentage of variance. The three factors of social integration are reported first: Faculty Interaction shows an equal number of computer-related variables occurring in the categories of frequency and breadth of microcomputer use. However $\underline{R}^2$ values for Faculty Interaction are larger for variables in the category of frequency. Peer-Group Interaction had an equal number of computer-related variables occurring in the categories of depth (computer self-efficacy) and breadth of microcomputer use with larger $\underline{R}^2$ values for variables in the category of depth of use. Institutional Concern for Student Development had the most computer-related variables with the largest $\underline{R}^2$ values occurring in the category representing frequency of microcomputer use. As a whole, social development had

the greatest number of computer-related variables representing frequency of microcomputer use, and variables with the largest $\underline{R}^2$ values were in the category of frequency.

The three dimensions of academic integration are also presented in Table 59. The first dimension, Academic and Intellectual Development, had a larger number of variables and variables with larger $\underline{R}^2$ values in the category of microcomputer breadth of use. Institutional and Goal Commitment likewise has the most variables with the largest $\underline{R}^2$ values representing the dimension of breadth. Finally, Spring USU GPA showed nearly equal numbers and $\underline{R}^2$ values in the categories of frequency of microcomputer use and breadth of use. As a whole, intellectual development had more computer-related variables with larger $\underline{R}^2$ values in the category representing breadth of use.

Results in Table 60 summarize those presented in the previous two tables and has the same purpose as these two tables: to relate dimensions of microcomputer use and freshman development. Results in Table 60 show that for only one factor, Peer-Group Interaction, did the number of variables and associated $\underline{R}^2$ values change the results obtained from Table 61.

Results in Table 60 show that freshman social development was predominantly related to variables representing the frequency dimension of microcomputer use, and that freshman Academic and Intellectual Development was predominantly related to variables representing the breadth dimension of microcomputer use. It is noteworthy, that Spring USU GPA is the only instance where both frequency and breadth variables had an equal influence in both analyses.

With this description of which dimensions of microcomputer use most strongly relate to freshman social and intellectual development, the next question that arises is

Table 61

Summary of Positive and Negative Beta Weights Produced in the Preferred Models of Regression Analyses

	Models with all (contextual and computer-related) variables			Models with just computer-related variables		
Criterion variable	Frequency	Breadth	C-SE	Frequency	Breadth	C-SE
RQ7: Social development analyses						
Factor 1: Faculty Interaction	-	-	+	+, +	+, -	
Factor 2: Peer Interaction	+	-, +	+, -		+, +	+, -
Factor 3: Institutional Concern	+, -			-, -, +	+	-
Total for RQ7	2-, 2+	2-, 1+	1-, 2+	2-, 3+	1-, 4+	2-, 1+
RQ8: Intellectual development analyses						
Factor 1: Academic Development		-, +, -		-, +	+, -, -, -	+
Factor 2: Institutional Development	-	+, -	+	-, +	-, -, +	+
Factor 3: Spring USU GPA	+	-		+, +, +	-, -, +	
Total for RQ8	1-, 1+	3-, 2+	1+	2-. 5+	7-, 3+	2+
Grand total	3-, 3+	6-, 3+	1-, 3+	4-, 8+	8-, 7+	2-, 3+

how do they relate? Results in Table 60 summarize the positive and negative beta weights produced in the preferred models of the regression analyses. The purpose of this synthesis is to categorize the relationships of microcomputer use dimensions with freshman development as either positive or negative.

Results in Table 61 indicate that the breadth dimension of microcomputer use related to social development both positively and negatively (see Appendix L). It also shows that the frequency dimension of microcomputer use was related to intellectual development negatively. The grand total indicates that the breadth dimension of microcomputer use predominantly related to freshman development negatively.

Variables representing frequency and breadth, the predominant dimensions of microcomputer use relating to freshman development, are listed in Table 62. The purpose of this synthesis is to present those computer-related variables most closely related to freshman development.

Variables in Table 62 are taken from a larger summary of all computer-related variables that entered the 12 regression analyses (see Appendix S). Where social development was the criterion variable, the microcomputer use dimension of frequency predominated. Analysis revealed that positively associated variables generally represented the use of microcomputers for games, communication, and the learning of difficult skills, such as database functions or the debugging of a program. One microcomputer-related variable that had a positive association occurred more than once; this variable had to do with the frequency of playing computer games. Negatively associated variables generally represented the short-term and long-term use of microcomputers.

Where intellectual development was the criterion variable, the microcomputer use dimension of breadth predominated. Analysis revealed that positively associated

Table 62

Beta Weights of Frequency and Breadth Variables Relating to Freshman Social and Intellectual Development

Dimension and variable description	β
Frequency variables with positive weights relating to social development	
Hours per week using a computer for assignments, games, and communication	.210
Estimate of hours per week using a computer for assignments	.179
Hours per week spent playing computer games	.171
Playing computer games, estimate of hours per week to be spent	.148
Playing computer games, estimate of hours per week to be spent	.138
Frequency variables with negative weights relating to social development	
Years of experience using a microcomputer	-.170
Hours per week using a computer for assignments: difference in hours per week	-.156
Total USU microcomputer lab entries for the freshman year 1996-1997	-.148
Breadth variables with positive weights relating to intellectual development	
Basic skill, save a document to disk	.166
Word processing skill, produce a résumé	.163
Word processing skill, produce a résumé	.152
Word processing skill, change in ability to use mail merge for form letters	.146
Basic skill, use Windows operating system	.140
Breadth variables with negative weights relating to intellectual development	
Information retrieval skill, change in ability to retrieve information over the Internet	-.227
Information retrieval skill, use an electronic bulletin board	-.216
Basic skill, change in ability to make a copy of a file	-.191
Information retrieval skill, use an electronic bulletin board	-.180
Basic skill, save a document to a disk	-.151
Database skill, change in ability to enter data into an existing database	-.151
Basic skill, change in ability to make a copy of a file	-.141
Information retrieval skill, change in ability to retrieve information over the Internet	-.135
Programming skill, write a program in code	-.124
Basic skill, copy a file	-.117
Number of software packages used during a microcomputer session	-.103

variables generally represented the use of microcomputers for basic skills and word processing. One computer-related variable occurred repeatedly in various models; this represents the ability to produce a résumé on word processing software. Negatively associated variables generally represented information retrieval skills, basic skills, and more advanced skills. Three computer-related variables occurred more than once, and all represent microcomputer skills. Two are information retrieval skills, ability to use an electronic bulletin board prior to entering the university and change during first year in ability to retrieve information over the Internet. The third is a basic skill, change in ability to make a copy of a file. Interestingly, two of the three negative variables that occurred more than once are environmental variables, which, according to Astin (1990), means they are controlled by the educators.

CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

The three parts of this final chapter are (a) a summary of the study, including a summary of findings; (b) conclusions drawn from the findings; and (c) recommendations for further research based on the conclusions.

Summary of the Study

Statement of the Problem

Utah State University's mission statement begins with this commitment: "Students are the focus as they seek intellectual, personal, and cultural development" (USU, 1996). Microcomputer technology as a resource can be assessed utilizing this mission statement. While students' use of microcomputers at USU has been studied in the past (see Hilton et al., 1993, Lutz & Hilton, 1990-91; Sanderson, 1992), research describing the relationship between microcomputer use and student development was not located. Currently, the possible benefits or consequences of microcomputer use may not be fully realized. Research linking microcomputer use to factors that are known and proven to predict student social and intellectual development would provide a knowledge base for maximizing time and money in this era of tight educational budgets.

Purpose of the Study

The purpose of the research is to examine how recognized dimensions of students' microcomputer use (e.g., computer self-efficacy [Compeau & Higgins, 1995], microcomputer skills [Furst-Bowe et al., 1995-96], and frequency of microcomputer use [Davis, 1989; Thompson et al., 1991]) relate to factors predictive of student development (e.g., peer interaction, satisfaction, and interaction with faculty [Astin,

1993]). The model developed for this study explores the relationship between dimensions of freshmen's use of microcomputers and dimensions of freshman development. The target population for this study is FTFT freshmen entering USU in the fall. Freshmen are sampled because, within the university environment, they are a relatively uncontaminated population with few confounding variables (Astin, 1990; Pascarella & Terenzini, 1980). To fulfill the purpose of this study, the following research questions were addressed:

1. Breadth of Use--What types of microcomputer skills do freshmen at USU report being able to perform, and how many different skills do freshmen perform on microcomputers?

2. Frequency of Use--How often do USU freshmen use microcomputers, and when they use microcomputers, how much time are they involved?

3. Depth of Use--How confident are USU freshmen about learning new microcomputer software?

4. Change in Use--How does microcomputer use change the first year that freshmen attend USU?

5. Social Development--To what degree do freshmen attending USU experience social development and how satisfied are they with social development.

6. Intellectual Development--What do the indicators of intellectual development tell us about the experience of freshmen at USU and how satisfied are they with their intellectual development?

7. Use and Social Development--What relationship exists between microcomputer use and freshman social development?

8. Use and Intellectual Development--What relationship exists between microcomputer use and freshman intellectual development?

An analysis of the generalizability of the findings was conducted at the outset. RQ1, RQ2, RQ3, RQ5, and RQ6 were presented using descriptive analysis. Longitudinal analysis was used to examine RQ4 and regression analysis was used to address RQ7 and RQ8.

Importance of the Study

This research is valuable as an institutional evaluation of the educational benefits of technology. It will likely be most valuable to the target institution, USU; however, the methodology and results of this study may be valuable for other institutions. The study is expected to assist educators and administrators with (a) decisions about microcomputer technologies taught in the college classroom, (b) institutional or departmental strategies for enhancing student development through access to information resources, and (c) budget decisions requiring information about the value of specific microcomputer uses (Ehrmann, 1995; Green & Gilbert, 1995).

Results from this study provide the following valuable information on freshman use of microcomputers in a university setting.

1. Recognition of the effect of various input, environmental, and outcome variables (e.g., demographics, self-assessment, time involvement, goal satisfaction, and so forth) context variables on student development.

2. Of the dimensions of microcomputer use in the study, identification of which are most closely related to student development and conventional measures of student performance.

3. Identification of dimensions of microcomputer use, which are positively related to freshman social and academic development, and dimensions of microcomputer use, which are negatively related to freshman social and academic integration.

Research Procedures

Various methods were employed to obtain completed questionnaires from the longitudinal sample of USU freshmen: In the fall of 1996, the largest portion (80%) came from attendees of the annual freshman orientation. Completed questionnaires were also obtained in the fall from a random list of freshmen supplied by USU Computer Services. This sample came from a list of all freshmen from which freshmen registered for the freshman orientation were excluded. Freshmen from this sample who completed the questionnaire composed 20% of the longitudinal sample. In the spring, lower-division classes (series 100) were surveyed to obtain matches with data from freshmen who returned completed questionnaires in the fall. Spring 1997 data for 65% of the 400 freshmen in the longitudinal sample were obtained in this manner. However, this method of surveying lower division classes was only partially successful. When it became apparent that matching data would be insufficient, a direct appeal via e-mail was made to students who returned surveys in the fall. In this manner, the final 35% of the responses were obtained and the longitudinal sample of 400 freshmen was completed.

Two dimensions of freshman development (i.e., social development and academic development) and their relationship to microcomputer use were investigated. Social development was operationalized as social integration and measured as USU freshman perceptions of (a) Peer-Group Interactions, (b) Interaction with Faculty, and (c) Institutional Concern for Student Development. Intellectual development was operationalized as (a) Academic and Intellectual Development, (b) Institutional and Goal Commitments, and (c) Spring USU GPA.

Descriptive, longitudinal, and regression analyses of the data produced findings that are summarized next. The following summaries of findings are organized by

research question using the same structure as Chapter IV, in which results were presented in five sections: generalizability analyses, descriptive analyses of microcomputer use, longitudinal analysis of microcomputer use, descriptive analyses of freshman development, and regression analyses.

Findings from the Generalizability Analyses

1. The longitudinal sample of 400 freshmen students was statistically different ($p < .01$) from the population of FTFT 1996 entering freshmen on gender (i.e., the percentage of males; see Table 3), mean ACT composite score (see Table 6), and mean HSGPA (see Table 7). However, differences on mean ACT composite score were not considered practically significant.

2. There was no statistically significant difference ($p < .01$) between the population of FTFT freshmen and the longitudinal sample on ethnic diversity (see Table 5), nor between the population of all freshmen and the longitudinal sample on residency status (see Table 8).

3. The one-year attrition rate of freshmen who attended the 1996 orientation was 46.2%; of those, 71.2% of the males dropped out before fall 1997, and 32.8% of the females (see Table 4). The higher rate of male attrition likely produced statistical and practical differences in the gender characteristics of the longitudinal sample.

4. The results of the nonresponse bias check showed practically significant differences ($\geq$10%) in gender, composite ACT scores, and self-ratings of social and self-ratings of academic ability between the sample and the population of all students classified by USU as full-time (but not first time) freshmen in the fall of 1996 (see Tables 9-11). Results in Table 9 show a practically significant difference between NRS group 1 and the longitudinal sample ($n = 400$): Where composite ACT was ≥ 25, the difference was 23%, and on the percentage of females the difference was 18%.

5. The sample seems to better represent the population of 1996 freshmen who persisted through spring quarter 1997 (see Tables 3, 5, and 6).

RQ 1-3: Descriptive Analyses of Microcomputer Use

Three dimensions of microcomputer use (i.e., breadth, frequency, and depth) were investigated.

6. Breadth: Prior to entering USU, the largest percentage of the sample reported skills in the categories of basic skills (e.g., use Windows = 90%), word processing (e.g., produce a résumé = 72.3%), and graphics (e.g., use clip art = 56.8%); and lacked skills in more complex uses of microcomputers (i.e., spreadsheets, database management, information retrieval, and programming; see Table 12).

7. Breadth: During a typical microcomputer session at USU, most of those in the sample (77.0%) said they used one or two software packages (see Table 14).

8. Frequency: Reporting for the prior year, a majority of the sample (55.3%) reported that they used a microcomputer frequently, over a third (38.8%) reported occasional use, and a small proportion (6.0%) no use at all (see Table 15).

9. Frequency: On average, sample members reported using microcomputers approximately 4.8 hours per week (see Table 16). For a typical week this was broken into approximately 2.8 hours per week doing assignments, about half an hour per week playing computer games, and about an hour and a half per week using a microcomputer to communicate with friends, family, or to make new friends.

10. Frequency: A majority of those in the sample (88.6%) reported spending an hour or less each time they used a microcomputer (see Table 17). It is estimated that

on the average a typical microcomputer session for those in the sample lasted 45 minutes or the length of one class period.

11. Computer self-efficacy: On average, sample members responded on a scale of 1 to 10 that they were moderately confident in completing an assignment using unfamiliar software (M = 6.02; see Table 18).

RQ 4: Longitudinal Analysis of Microcomputer Use

12. Breadth: In the spring, the largest percentage of the sample reported skills in the category of basic skills (82%) and the smallest percentage reported skills in programming (18%). Skill categories that showed the greatest increase were information retrieval skills (132%) and database skills (100%). The least change occurred in the category of programming skills (6%; see Table 19).

13. Breadth: The number of skills freshmen in the sample reported being able to do increased by an average of 56% in the first academic year at USU (see Table 20).

14. Frequency: Total hour-per-week microcomputer use while attending USU was not practically different (≥10%) regardless of whether entering freshmen reported in the year prior they used microcomputers "not at all" (4.3 hr/wk), "occasionally" (4.4 hr/wk), or "frequently" (4.8 hr/wk). However, there were practical differences in specific uses (e.g., using a computer for assignments) when these three subgroups were compared (see Table 21).

15. Frequency: Expected use of microcomputers for academic activities exceeded 7 hours per week, but reported use was slightly under 5 hours; actual use of microcomputers for assignments was 3 hours less than was expected. However, use

of computers to talk to family and friends was half an hour per week more than was expected (see Table 22).

16. Computer self-efficacy: Though comparatively small (< 30%), there was an increase in confidence for the sample across all 10 situations related to learning new software as presented in the Measure of Computer Self-Efficacy (Compeau & Higgins, 1995; see Table 23).

RQ 5-6: Descriptive Analyses of Freshman Development

17. Social development: Spring 1997, a majority of the sample responded positively to items forming the three factors of social development: Interactions with Faculty (63.9%), Institutional Concern for Student Development (75%), and Peer-Group Interaction (94.2%; see Table 24).

18. Social development: Expectations expressed in the fall by sample members for hour-per-week involvement in talking with teachers outside of class (% diff = -53%) and volunteer work (% diff = -33%) were not attained; however, expectations were exceeded in hour-per-week involvement in social activities with friends (% diff = 6%; see Table 25).

19. Social development: In general, those in the sample were satisfied with their progress toward achieving social goals (% diff < 30%); however, they were dissatisfied with their progress toward achieving specific social goals: finding a lifetime partner (% diff = -27%), developing leadership skills (% diff = -20%), and being involved in student activities (% diff = -20%; see Table 26).

20. Intellectual development: A majority of the sample responded positively to items forming the two factors of intellectual development: Academic and Intellectual Development (85.1%) and Institutional and Goal Commitment (95.4%; see Table 27).

21. Intellectual development: The average cumulative GPA of freshmen in the longitudinal sample at the end of spring quarter was .5 below their high school GPA (see Table 28).

22. Intellectual development: Hour-per-week expectations of those in the sample were not attained for the three academic activities investigated: studying or doing homework (% diff = -16%), working with friends on homework (% diff = -36%), and using a library (% diff = -49%; see Table 29).

23. Intellectual development: Freshmen in the sample were dissatisfied with their progress on completing academic goals, in particular a few that were career-oriented: The greatest percent difference between ratings of importance and satisfaction was for the goal to obtain a job related to studies (% diff = -51%); the smallest percent difference was for the goals to improve computer skills (% diff = -12%) and learn to perform better under pressure (% diff = -6%; see Table 30).

RQ 7-8: Regression Analyses Relating Microcomputer Use and Freshman Development

24. The proportion of variance within each of the regression equations was statistically significant at the $p < .01$ level and met all the assumptions for regression analysis (see Tables 31and 32).

25. Faculty Interaction--frequency: Regression analyses using sample data when Faculty Interaction was the criterion variable (see Tables 33-36) found the following: (a) More output variables entered the model when all variables were analyzed, and more input variables entered the model when just computer-related variables were analyzed (see Table 57); (b) computer-related variables representing frequency of microcomputer use entered both regression equations first (see Table

58-60); and (c) beta weights were positive for four computer-related variables and negative for three (see Table 61).

26. Peer-Group Interaction--breadth of use and computer self-efficacy: Regression analyses using Peer-Group Interaction as the criterion variable (see Tables 37-40) showed the following: (a) The largest portion of variables was outputs (see Table 57); (b) a computer-related variable representing the dimension of breadth was the first to enter the regression analysis that included all variables, and a variable representing computer self-efficacy was the first to enter the analysis that included just computer-related variables (see Tables 58-60); and (c) beta weights were positive for six computer-related variables and negative for three (see Table 61).

27. Institutional Concern for Student Development--frequency: Analyses showed that when Institutional Concern for Student Development was the criterion variable (see Tables 41-44): (a) the largest portion of variables were inputs (see Table 57); (b) computer-related variables representing the dimension of frequency were the first to enter both regression analyses (see Table 58-60); and (c) beta weights were positive for three computer-related variables and negative for four (see Table 61).

28. Academic and Intellectual Development--breadth of use: Analyses performed when Academic and Intellectual Development was the criterion variable (see Tables 45-48) showed the following: (a) In both analyses inputs and outputs were equal (see Table 57); (b) computer-related variables representing the dimension of breadth were the first to enter both regression analyses (see Table 58-60); and (c) beta weights were positive for three computer-related variables and negative for four (see Table 61).

29. Institutional and Goal Commitment--breadth of use: Analyses performed when Institutional and Goal Commitment was the criterion variable (see Tables 49-52) showed the following: (a) More input variables entered the model when all variables

were analyzed, and more output variables entered the model when just computer-related variables were analyzed (see Table 57); (b) computer-related variables representing the dimension of breadth were the first to enter both regression analyses (see Table 55-60); (c) beta weights were positive for five computer-related variables and negative for five (see Table 61).

30. Spring USU GPA--frequency and breadth of use: Analyses performed when Spring USU GPA was the criterion variable (see Tables 53-56) showed the following: (a) More output variables entered the model when all variables were analyzed, and more environmental variables entered the model when just computer-related variables were analyzed (see Table 57); (b) computer-related variables representing the dimensions of breadth and frequency entered both regression analyses early (see Table 55-60); (c) beta weights were positive for five computer-related variables and negative for three (see Table 62).

31. Social development and positive frequency: Variables that were positively associated with social development represented the use of microcomputers for games, communication, and the learning of difficult skills such as database functions or debugging a program (see Table 62).

32. Social development and negative frequency of microcomputer use: Variables that were negatively associated with social development generally represented the overall frequency of microcomputer use (e.g., years of experience and total lab entries; see Table 62).

33. Intellectual development and positive breadth of microcomputer use: Variables that were positively associated with intellectual development represented the use of microcomputers for basic skills and word processing (see Table 62).

34. Intellectual development and negative breadth: Variables that were negatively associated with intellectual development generally represented information retrieval skills and more advanced skills (see Table 62).

Conclusions

Conclusions are organized by research question using the structure of Chapter IV. As in the findings, there are five parts: generalizability, microcomputer use, changes in microcomputer use, freshman development, and the relationship between microcomputer use and freshman development.

Conclusions About the Generalizability Analyses

1. Based on findings number 1 through 5, it is concluded that the findings from this study could be generalized to the population of FTFT freshmen who entered USU in the fall of 1996 and continued attending the university into spring quarter 1997. For brevity's sake, this population will be referred to henceforward as USU freshmen.

2. Based on finding number 3, it is concluded that nearly half of USU freshmen were not enrolled 1 year after they entered. Tinto (1993) suggested that in comparison to other 4-year public universities that this is an unusually high rate of attrition.

RQ 1-3: Conclusions About Microcomputer Use

3. Based on finding numbers 6 and 7, it is concluded that entering USU freshmen used microcomputers largely for word processing and simple graphics and lacked skills in more complex uses of microcomputers (i.e., spreadsheets, databases, information retrieval, and programming).

4. Based on finding number 8, it is concluded that prior to entering, approximately half of USU freshmen used microcomputers frequently and about half used microcomputers either sporadically or not at all.

5. Based on finding number 9, it is concluded that USU freshmen used microcomputers almost 5 hours per week during their first year at USU; about half of this time was used for doing assignments; about a third to communicate with friends, family, or to make new friends; and about a tenth of the time was used to play computer games.

6. Based on finding number 10 and analysis of computer lab entry logs obtained from USU Computer Services (which challenges these conclusions by showing that on the average freshmen entered computer labs twice in a week), it is concluded that USU freshmen used microcomputers mainly between class sessions.

7. Based on finding number 11, it is concluded that on the average USU freshmen were moderately confident about completing an assignment with new software.

RQ4: Conclusions About Changes in Microcomputer Use

8. Based on finding number 12, it is concluded that in spring 1997 most USU freshmen had basic skills and most did not have programming skills, also that during the academic year information retrieval skills (e.g., e-mail and Internet use) and database skills were the two categories in which USU freshmen learned the most.

9. Based on finding number 13, it is concluded that on the average USU freshmen increased the number of skills they reported being able to do by more than half during the academic year.

10. Based on finding number 14, it is concluded that USU freshmen used microcomputers with a frequency that was not statistically different regardless of whether they reported that in the year prior to entering USU they had used a computer "not at all," "occasionally," or "frequently." This finding provides evidence that microcomputer use is well integrated into the freshman experience.

11. Based on finding number 15, it is concluded that in general USU freshmen did not use microcomputers during the academic year as much a they had expected; however, they used microcomputers to communicate with family and friends and to make new friends more than they expected.

12. Based on finding number 16, it is concluded that on the average USU freshmen experienced a small increase in their confidence to learn to use new software during the academic year.

RQ 5-6: Conclusions About Freshman Development

13. Based on finding number 17, it is concluded that a majority of USU freshmen were positive about their social development.

14. Based on finding number 18, it is concluded that on the average the expectations of USU freshmen for involvement in social activities were not attained, particularly in the areas of talking with teachers outside of class and volunteer work.

15. Based on finding number 19, it is concluded that on the average USU freshmen were satisfied with their progress toward completing social goals. However, they were somewhat dissatisfied with their progress toward completing goals relating to finding a lifetime partner, developing leadership skills, being involved in student activities, and receiving advice on their goals.

16. Based on finding number 20, it is concluded that a majority of the USU freshmen were positive about their intellectual development.

17. Based on finding number 21, it is concluded that on the average USU freshmen had a spring GPA that was .5 below their high school GPA.

18. Based on finding number 22, it is concluded that on the average the expectations of USU freshmen for involvement in academic activities were not attained, particularly in the area of studying or doing homework.

19. Based on finding number 23, it is concluded that in general USU freshmen were dissatisfied with their progress toward achieving academic goals, in particular obtaining a job related to their studies. However, they were satisfied with improvements in their computer skills and learning to perform better under pressure.

RQ 7-8: Conclusions About the Relationship Between Microcomputer Use and Freshman Development

20. Based on finding numbers 25 and 27, it is concluded that on the average the frequency of microcomputer use was most closely related to the social development of USU freshmen, in particular to their informal interaction with faculty and to their perceptions of Institutional Concern for Student Development (see Figure 3).

21. Based on finding number 26, it is concluded that on the average USU freshmen's confidence in using microcomputers, or computer self-efficacy, was most closely related to the social development they experienced as a result of Peer-Group Interaction (see Figure 3).

22. Based on finding numbers 28 through 30, it is concluded that on the average USU freshmen's breadth of microcomputer use was most closely related to the three dimensions of their intellectual development (Academic and Intellectual Development,

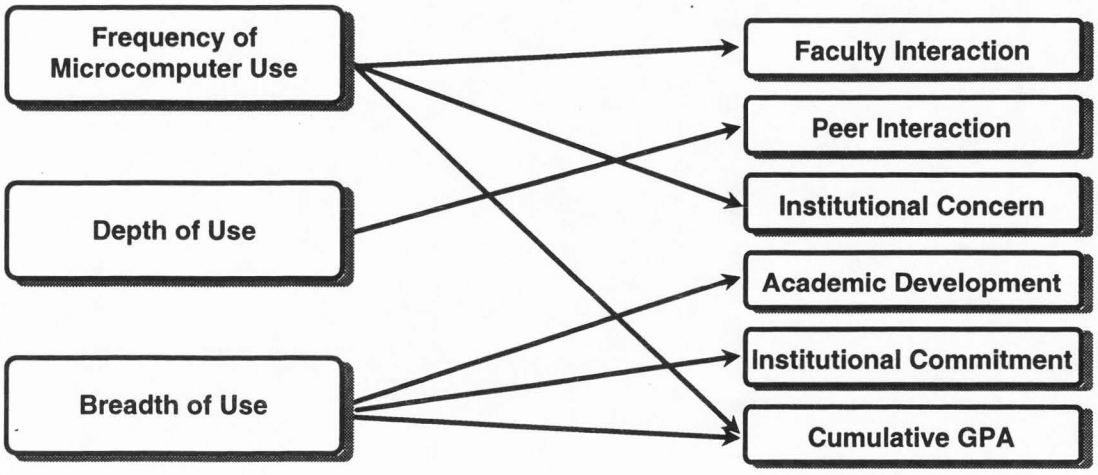

Figure 3. Model relating microcomputer use and student development showing results of regression analyses.

Institutional and Goal Commitment, and Spring USU GPA) and included in the study (see Figure 3).

23. Based on finding number 30, it is concluded that on the average USU freshmen's spring GPA was also weakly related to frequency of microcomputer use.

24. Based on findings number 25 through 30, the model for relating microcomputer use and student development proposed at the end of the literature review (see Figure 2.) can be expanded. Figure 3 depicts this expanded model relating microcomputer use to freshman development. Unlike previous depictions of the model, in Figure 3 freshman development is broken into the six factors that were researched, and arrows illustrate the relationship between dimensions of microcomputer use and the factors composing freshman development.

25. Based on findings number 31 and 32, it is concluded that frequency was the dimension of microcomputer use which had the strongest relation (both positive and negative) to freshman social development.

26. Based on findings number 33 and 34, it is concluded that breadth was the dimension of microcomputer use which had the strongest relation (both positive and negative) to freshman intellectual development.

27. Based on finding number 31, it is concluded that on the average USU freshmen's frequent use of microcomputers for games, communication, and the learning of difficult skills such as database functions or debugging a program had the strongest positive association to their social development.

28. Based on finding number 32, it is concluded that on the average USU freshmen's frequency of microcomputer use had the strongest negative association with their social development.

29. Based on finding number 33, it is concluded that on the average USU freshmen's use of microcomputers for word processing had the strongest positive association with their intellectual development.

30. Based on finding number 34, it is concluded that on the average USU freshmen's use of microcomputers for information retrieval and more advanced skills had the strongest negative association with their intellectual development.

Recommendations

Inasmuch as the design of this research was exploratory, the conclusions presented in the previous section need replication. Therefore, all of the recommendations that follow are subject to further confirmation. Recommendations are organized by research question to correspond to the previous two sections of this chapter.

Research for Generalizability

1. Based on conclusion numbers 1 and 2, further research is recommended to understand microcomputer use and the social and academic development of the population of freshmen entering USU in the fall and continuing through spring.

2. Based on conclusion numbers 1 and 2, further research is recommended that makes a comparison between the microcomputer use of the population of freshmen who continue through Spring Semester and the microcomputer use of the population of freshmen who voluntarily drop out prior to completing Spring Semester.

3. Based on conclusion numbers 1 and 2, it is recommended that this research should be replicated in a variety of institutions, with nontraditional students, as well as traditional students, and with upperclassmen as well as freshmen to determine the specific effects of microcomputer use on student development.

4. Based on conclusion number 2, further research is recommended that investigates attrition rate of freshmen at USU and their use of microcomputers.

RQ 1-3: Research on Microcomputer Use

5. Based on conclusions number 3 and 4, it is recommended that USU accept the responsibility for teaching microcomputer use because it appears the high schools are not providing adequate microcomputer use for their students. In fulfillment of this responsibility, further research is recommended into how students in high schools that feed into USU are using microcomputers and what can be done to increase the breadth and frequency of their use.

6. Based on conclusions number 5 and 6, it is recommended that further research be done through direct observation to produce a more accurate estimate of the average hour-per-week frequency of student microcomputer use. It is further

recommended that once an average hour-per-week frequency is obtained that a comparison be made to other public 4-year universities to explore different strategies for enhancing student access to microcomputers.

7. Based on conclusions number 7 and 12, it is recommended that research be conducted to explore methods to improve the modest increases in computer self-efficacy (< 30%) that occurred for USU freshmen during their first academic year.

8. Conclusions number 8 and 9 suggest that students at USU are acquiring information retrieval, database, and spreadsheet skills; however, they are not acquiring programming and word processing skills, and word processing skills have the strongest positive association with intellectual development. It is, therefore, recommended that further research be done into how students acquire word processing and programming skills and the differences in how skill acquisition occurs across the various skill categories.

9. Based on conclusion number 10, freshman use of microcomputers is similar regardless of how much they used computers prior to attending USU, further research is recommended to confirm that this equalization of microcomputer use is a result of microcomputer use being well integrated into the freshman experience at USU.

10. Based on conclusion number 11 and theory-based research cited in the review of the literature, it is recommended that further research be done into the difference between freshmen's intention to use microcomputers (measured in this study as their expected hour-per-week use and actual hour-per-week use of microcomputers, especially for academic purposes such as doing assignments or homework). The difference between expected and actual use suggest that there may be a barrier to microcomputer use for academic purposes that does not exist for

communication or entertainment–it may be that use of microcomputers for other purposes is the barrier to academic use.

RQ 5-6: Research About Freshman Development

11. Based on conclusions number 13-15, it is recommended that USU increase informal interaction between undergraduate students and faculty. In addition, it is recommended that further research be conducted at USU on students' informal interaction with faculty. Pascarella and Terrenzini's (1991) comprehensive overview of student development found that informal interaction with faculty was the foremost factor in student persistence and development (also see Astin, 1993).

12. Based on conclusions number 16-19, further research is recommended into students' intellectual development at USU. One focus of the research would be the difference between a student's intention to be involved in academic activities and actual hours-per-week involvement in academic activities. Of special concern would be students' use of libraries, which this research suggests is nearly half the expected hour-per-week usage. Again, this suggests that there is a barrier to students' involvement in this and possibly other academic activities. Another focus could be freshmen's expectations for acquiring jobs in their field of study and career exploration.

RQ 7-8: Research On Development and Microcomputer Use

13. Based on conclusion number 20, further research is recommended into the relationship between students' social development and their use of microcomputers. It is recommended that USU Student Services target the social integration of students who make extensive use of microcomputers. Interestingly, students who were less

likely to integrate socially are those who are more self-reliant when learning new skills or software. They are also those who make greater use of the microcomputer labs and who are more likely to use software for assignments or for work, rather than for communication or entertainment. Further research is recommended into microcomputer use that is positively associated with social integration, such as playing games or using e-mail. Also, research is recommended into microcomputer use that is negatively associated with students' social integration, such as frequent use of microcomputers prior to entering the university and drastic increases in usage during the freshman year.

14. Based on conclusion number 21, it is recommended that research be conducted into the feasibility of the recommendations made by Hilton et al. (1993), that USU develop mentor relationships to advance microcomputer use. The present study indicates that social integration is facilitated by microcomputer use when freshmen have someone they can rely upon for assistance, especially when they are learning new software or when they are learning an advanced skill.

15. Based on conclusions number 22 and 23, it is recommended that more complex, computer-based assignments occur in a wider variety of general education courses. In particular, it is recommended that courses in all areas, not to exclude areas such as Business Information Systems and Education and Computer Science, increase assignments that require in-depth knowledge of word processing software. It is recommended that further research be conducted into the relationship between breadth of microcomputer use and intellectual development.

16. Based on conclusion number 24, further research is recommended that expands the statistical analysis of this study beyond correlation and regression. The

model in Figure 3 could be elaborated through structured equation modeling, which would produce a numerical value indicating strength for each of the relationships.

17. Based on conclusion number 24, elaboration of the model is recommended through qualitative research. Anderson and McClard (1993; Anderson, McClard, & Larkin, 1995) was the only qualitative study found that examined undergraduate students' use of microcomputers. Inasmuch as this qualitative study was completed over a decade ago, given the changes in technology, it is recommended that a qualitative study replicating Anderson and McClard be carried out.

18. Based on conclusion number 25 and 27, it is recommended that microcomputer use for entertainment and communication be continued, and that additional research be conducted into the conclusion that there is a positive relationship between social development and students' frequency of microcomputer use for entertainment, communication, and learning difficult tasks. Research is recommended into microcomputer-based assignments that strengthen social development and integration.

19. Based on conclusions number 26 and 29, it is recommended that additional research be conducted into the conclusion that there is a positive relationship between intellectual development and breadth of use. To increase breadth of use and hasten academic integration, it is recommended that USU encourage student ownership of microcomputers and frequent use in a wide variety of courses.

20. Based on conclusion number 30, further research is recommended into the conclusion that the use of the Internet during the first year may interfere with freshman intellectual development. It is recommended that USU conduct research into limiting freshman use of the Internet for nonacademic purposes.

As microcomputer use continues to grow, it is hoped that this research will prove its value as an assessment of microcomputer technology in the campus environment. Of course, every assessment of an institution of higher education could present a unique set of variables, yet the model constructed from this research can assist in an initial understanding of the relationship between the microcomputer use that an institution has fostered and the student development it strives to attain. Possibly of greater value is the contribution that this model can make in the formulation of theories for student microcomputer use in higher education. Throughout, the research has sought established theories of social psychology and student development as a base for exploration. Many of the findings parallel research from those fields. Hopefully this model can lead to further use of theory in studying the expanding role of microcomputers in student learning and development in higher education.

REFERENCES

Ajzen, I. (1988). Attitudes, personality, and behavior. Chicago: Dorsey Press.

Ajzen, I., & Fishbein, M. (1980). Understanding and predicting social behavior. Englewood Cliffs, NJ: Prentice-Hall.

Anastasi, A. (1988). Psychological testing (6th ed.). New York: Macmillan.

Anderson, K. T., & McClard, A. P. (1993). Study time: Temporal orientation of freshmen students and computing. Anthropology and Education Quarterly 24(2) 159-177.

Anderson, K. T., McClard, A. P., & Larkin, J. (1995). The social ecology of student life: The integration of technological innovation in a residence hall. In M. A. Shields (Ed.), Work and technology in higher education: The social construction of academic computing (pp. 19-39). Hillsdale, NJ: Erlbaum.

Arosteguy, S. (1996). Measuring the computer literacy of secondary students. (Unpublished paper).

Astin, A. W. (1970a). The methodology of research on college impact (I). Sociology of Education, 43, 223-254.

Astin, A. W. (1970b). The methodology of research on college impact (II). Sociology of Education, 43, 437-450.

Astin, A. W. (1979). Four critical years. San Francisco: Jossey-Bass.

Astin, A. W. (1984). Student involvement: A developmental theory for higher education. Journal of College Student Personnel, 25, 297-308.

Astin, A. W. (1990). Assessment for excellence: The philosophy and practice of assessment and evaluation in higher education. New York: Macmillan.

Astin, A. W. (1993). What matters in college: Four critical years revisited. San Francisco: Jossey-Bass.

Astin, A. W. (1996). Involvement in learning revisited: Lesson we have learned. Journal of College Student Development, 37(2), 123-133.

Baker, R. W., & Schultz, K. L. (1992). Experiential counterparts of test-indicated disillusionment during freshman adjustment to college. NACADA Journal, 12(2) 13-22.

Bandura, A. (1982). Self-efficacy mechanism in human agency. American Psychologist, 37(2), 122-147.

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

Blumenstyk, G. (1994, November 22). Colleges struggle to develop formal strategies to pay for computing. Chronicle of Higher Education, 41, A44-5.

Boettner, L. M. (1991). Computer anxiety: Its related characteristics and its relationship to achievement in computer literacy of slippery rock university students. Ann Arbor, MI: UMI Dissertation Services.

Borg, W. R., & Gall, M. D. (1989). Educational research: An introduction (5th ed.). New York: Longman.

Bowers, C. A. (1988). The cultural dimensions of educational computing. New York: Teachers College Press.

Bowers, C. A. (1995). Educating for an ecologically sustainable culture. Albany: State University of New York Press.

Bracht, G. H., & Glass, G. V (1968). The external validity of experiments. American Educational Research Association, 5(4) 437-474.

Burkhardt, M. E., & Brass, D. J. (1981). Changing patterns or patterns of change: The effects of change in technology on social network structure and power. Administrative Science Quarterly, 35(1) 104-127.

Calder, W. B. (1993). First-year students' goals: Six years in the life of a student goals inventory. Journal of the Freshman Year Experience, 2, 105-121.

Campbell, N. J. (1992). Enrollment in computer courses by college students: Computer proficiency, attitudes, and attributions. Journal of Research on Computing in Education, 25(1), 61-75.

Chickering, A. W., & Ehrmann, S. C. (1998). Implementing the seven principles: Technology as lever (On-line). Available: http://www.thtlgroup.org/ehrmann.htm

Chickering, A. W., & Reisser, L. (1993). Education and identity (2nd ed.). San Francisco: Jossey-Bass.

Cohen, J. & Cohen, P. (1983). Applied multiple regression and correlational analysis for the behavioral sciences (2nd ed.). Hillsdale, NJ : Erlbaum

Compeau, D. R., & Higgins, C. A. (1995). Computer self-efficacy: Development of a measure and initial test. MIS Quarterly, 5, 189-211.

Crable, E. A., Brodzinski, J. D., Scherer, R. F., & Jones, P. D. (1994). The impact of cognitive appraisal, locus of control, and level of exposure on the computer anxiety of novice computer users. Journal of Educational Computing Research, 10(4), 329-340.

Crystal, L. (Executive Producer). (1995, December 27). The MacNeil/Lehrer news hour. New York and Washington, DC: Public Broadcasting Service.

Dannefer, D. (1984). Adult development and social theory: A paradigmatic reappraisal. American Sociological Review, 49, 847-850.

Davidson, G. V., Savenye, W. C., & Orr, K. B. (1992). How do learning styles relate to performance in a computer applications course? Journal of Research on Compuing in Education, 24(3), 348-358.

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. MIS Quarterly, 13(3), 227-247.

Davis, F. D., Bagozzi, R. P., & Warshaw, P. R. (1992). Extrinsic and intrinsic motivation to use computers in the workplace. Journal of Applied Social Psychology, 22 (14), 1111-1132.

Demetrulias, D. M. (1985). Gender differences and computer use. Educational Horizons, 63, 133-135.

Dillman, D. (1978). The total design mentod (TDM). New York: Wiley.

Dologite, D. G., Ryan, S., & Ferns, W. (1990-91). The undergraduate introductory computer course: A comparison of advanced with other students. The Journal of Computer Information Systems, 12, 50-55.

Duncan, D. (1990). Personal computing proficiency as a business school prerequisite. The Journal of Computer Information Systems, 11, 13-17.

Ehrmann, S. C. (1991). Gauging the educational value of a college's investments in technology. Educom Review, 26(3,4) 24-28.

Ehrmann, S. C. (1995). Asking the right questions: What does research tell us about technology and higher learning? Change, 27(2), 20-27.

Fann, G. L., Lynch, D. H., & Murranka, P. (1988-89). Integrating technology: Attitudes as a determinant of the use of microcomputers. Journal of Educational Technology Systems, 17(4), 307-317.

Fantino, E., & Reynolds, G. S. (1975). Introduction to contemporary psychology. San Francisco: Freeman.

Feldman, K. (1972). Some theoretical approaches to the study of change and stability of college students. Review of Educational Research, 42, 133-150.

Fishbein, M., & Ajzen, I. (1975). Belief, attitude, intention, and behavior: An introduction to theory and research. Reading, MA: Addison-Wesley.

Furst-Bowe, J., Boger, C., Franklin, T., McIntyre, B., Polansky, J., & Schlough, S. (1995-96). An analysis of required computer competencies of university students. Journal of Research on Computing in Education, 28(2), 175-189.

Gabriel, R. M. (1985a). Assessing computer literacy: A validated instrument and empirical results. AEDS Journal, 11, 153-171.

Gabriel, R. M. (1985b). Computer literacy assessment and validation: Empirical relationships at both student and school levels. Journal of Educational Computing Research, 1(4), 415-425.

Geissler, J. E., & Horridge, P. (1993). University students' computer knowledge and commitment to learning. Journal of Research on Computing in Education 25(3), 347-365.

Gilbert, S. W. (1996). Making the most of a slow revolution. Change, 31, 24-29.

Gist, M. E., Schowoerer, C. E., & Rosen, B. (1989). Effects of alternative training methods on self-efficacy and performance in computer software training. Journal of Applied Psychology, 12(3) 884-891.

Green, K. C. (1995). Paying the digital piper. Change, 27, 53-54.

Green, K. C. (1996). The coming ubiquity of information technology. Change, 31, 24-28.

Green, K. C., & Gilbert, S. (1995). Great expectations: content, communications, productivity, and the role of information technology in higher education. Change, 27, 8-18.

Gregorc, A. F. (1984). Gregorc style delineator: Development technical and administration manual. Columbia, CT: Gregorc Associates.

Hill, T., Smith, N. D., & Mann, M. F. (1987). Role of efficacy expectations in predicting the decisions to use advanced technologies: The case of computers. Journal of Applied Psychology, 72(2), 307-313.

Hilton, T. S. E., LaBonty, D., Bartholome, L. W., & Stocker, H. R. (1993). Computer software instruction: Is it worth college credit? Proceedings of the International Association of Computer Information Systems, 105-112.

Igbaria, M. (1990). End-user computing effectiveness: A structural equation model. Omega, 18(6), 637-652.

Igbaria, M., Pavri, F. N., & Huff, S. L. (1989). Microcomputer applications: An empirical look at usage. Information Management, 16, 187-196.

Igbaria, M., Schiffman, S. J., & Wiekcowski, T. J. (1994). The respective roles of perceived usefulness and perceived fun in the acceptance of microcomputer technology. Behavior and Information Technology, 13(6), 349-361.

Judd, D. R. (1995). Measuring the computer literacy of first-year students entering Utah State University. Unpublished manuscript, Early Intervention Research Institute, Utah State University, Logan.

Kagan, D., & Pietron, L. R. (1987). Cognitive level and achievement in computer literacy. The Journal of Psychology, 12(4), 317-327.

Kay, R. H. (1989). A practical and theoretical approach to assessing computer attitudes: The Computer Attitude Measure (CAM). Journal of Research on Computing in Education, 21(4), 456-463.

Kay, R. H. (1992a). The computer literacy potpourri: A review of the literature. Journal of Research on Computing in Education, 24(4), 446-456.

Kay, R. H. (1992b, April). An examination of gender differences in computer attitudes, aptitudes, and use. Paper presented at the Annual Conference of the American Educational Research Association, San Francisco, CA. (ERIC Document Reproduction Services #ED 346 848)

Kay, R. H. (1993a). A practical research tool for assessing ability to use computers: The Computer Ability Survey (CAS). Journal of Research on Computing in Education, 26(1), 16-27

Kay, R. H. (1993b). An exploration of theoretical and practical foundations for assessing attitudes towards computers: The Computer Attitude Measure (CAM). Computers in Human Behavior, 9, 371-386.

Kay, R. H. (1993-94). Understanding and evaluating measures of computer ability: Making a case for an alternative metric. Journal of Research on Computing in Education, 26(2), 270-283.

Keen, P. G. (1980). MIA research: Reference disciplines and a cumulative traditions. Proceedings of the International Conference on Information Systems, 3, 9-18.

Kennedy, G. J., Gordon, R. L., & Gordon, V. N. (1995). Changes in social and academic integration in freshmen of high and average ability: Implications for retention. NACADC Journal, 15(2), 9-19.

Kerlinger, F. N. (1986) Foundations of behavioral research (3rd ed.). New York: Holt, Rinehart, and Winston.

Khan, M. B., & Jessup, L. M. (1991). Computer literacy of incoming undergraduate business majors. The Journal of Computer Information Systems, 14, 13-17.

Koslowsky, M., Hoffman, M., & Lazar, A. (1990). Predicting behavior on a computer from intentions, attitudes, and experience. Current Psychology: Research and Review, 9(1), 75-83.

Larson, J., & Smith, M. A. (1994). An assessment of the computer literacy and computer attitudes of incoming first-year students at the University of Wisconsin-Eau Claire. In J. Larson & M. A. Smith (Eds.), Selected research and development presentations at the 1994 convention of the association for educational communications and technology (pp. 357-360). Eau Claire: University of Wisconsin.

Lee, D. M. S., Pliskin, N., Kahn, B. (1994). The relationship between performance in a computer literacy course and students' prior achievement and knowledge. Journal of Educational Computing Research, 10(1), 63-77.

Light, R. J., Singer, J. D., & Willet, J. B. (1990). By design: Planning research on higher education. Cambridge: Harvard University Press.

Loyd, B. H., & Gressard, C. (1984). Reliability and factorial validity of computer attitude scales. Educational and Psychological Measurement, 44, 501-505.

Lucas, H. C., Jr. (1974). Systems quality, user reactions and the use of information systems. Management Informatics, 3(4), 207-212.

Lutz, C. M., & Hilton, T. S. E. (1990-91). The evolution of a computer literacy course: A longitudinal study. Journal of Computer Information Systems, 31(2), 38-46.

Marcoulides, G. A., & Xiang-Bo, W. (1990). A cross-cultural comparison of computer anxiety in college students. Journal of Educational Computing Research, 6(3), 251-263.

Martinez, M. E., & Mead, N. A. (1988). Computer competence: The first national assessment. Princeton, NJ: Educational Testing Service. (ERIC Document Reproduction Service No. ED 341 375)

Muffoletto, R., & Knupfer, N. N. (Eds.) (1993). Computers in education: Social, political and historical perspectives. Cresskill, NJ: Hampton Press.

Murphy, C. A., Coover, D., & Owen, S. V. (1989). Development and validation of the computer self-efficacy scale. Educational and Psychological Measurement, 49 893-899.

Nogami, G. Y. (1996). Eight points for more useful surveys. Quality Progress, 29(10), 93-96

Norušis, M.J. (1990). The SPSS guide to data analysis for release 4. Chicago:SPSS, Inc.

Pace, C. R., (1986). Quality, content, and context in the assessment of student learning and development in college. Los Angeles: Center for Research on Evaluation, Standards, and Student Testing, University of California at Los Angeles.

Paré, G., & Elam, J. J. (1995). Discretionary use of personal computers by knowledge workers: Testing of a social psychology theoretical model. Behavior and information technology, 14(4), 215-228.

Pascarella, E., & Terenzini, P. T. (1980). Predicting freshman persistence and voluntary dropout decisions from a theoretical model. Journal of Higher Education, 51(1), 60-75.

Pascarella, E., & Terenzini, P. T. (1991). How college affects students: Findings and insights from twenty years of research. San Francisco: Jossey-Bass.

Porter, L. W., & Lawler, E. E. (1968). Managerial attitudes and performance. Homewood, IL: Irwin-Dorsey.

Postman, N. (1992). Technopoly: The surrender of culture to technology. New York: Knopf.

Postman, N. (1995). Making a living, making a life: Technology reconsidered. The College Board Review, 176/177, 8-13.

Resmer, M., Mingle J. R., & Oblinger, D. (1995). Computers for all students: A strategy for universal access to information resources. Denver, CO: State Higher Education Executive Officers.

Robey, D. (1979). User attitudes and management information system use. Academy of Management Journal, 22(3), 527-538.

Sanderson, W. W. (1992). A study of students' gender and achievement in introductory microcomputer classes at Utah State University. Unpublished master's thesis, Utah State University, Logan.

Sax, L. J., Astin, A. W., Korn, W. S., & Mahoney, K. M. (1995). The American freshman: National norms for fall 1995. Los Angeles: Higher Education Research Institute, University of California at Los Angeles.

Sax, L. J., Astin, A. W., Korn, W. S., & Mahoney, K. M. (1996). The American freshman: National norms for fall 1996. Los Angeles: Higher Education Research Institute, University of California at Los Angeles.

Sailor, P. (1997). The relationship between graduate students' education in research ethics and their attitudes toward research misconduct. Unpublished doctoral dissertation, Utah State University, Logan.

Sekaran, U. (1992). Research methods for business: A skill building approach. (2nd ed.). New York: Wiley.

Seymour, D. (1996). High performing colleges: The Malcolm Baldrige National Quality Award as a framework for improving higher education. Maryville, MO: Prescott.

Shaver, J. P. (1979). The productivity of educational research and the applied-basic research distinction. Educational Researcher, 8(1) 3-9.

Shaver, J. P., & Norton, R. S. (1980). Randomness and replication in ten years of the American Educational Research Journal. American Educational Research Journal, 9(1) 9-15.

Shewe, C. D. (1976). The information system user: An exploratory behavioral analysis. Academy of Management Journal, 19, 577-590.

Simonson, M. R., Maurer, M., Montag-Torardi, M., & Whitaker, M. (1987). Development of a standardized test of computer literacy and a computer anxiety index. Journal of Educational Computing Research, 3(2), 231-247.

Snyder, T. D., & Hoffman, C. M. (1995) National center for education statistics: Digest of education statistics 1995. Washington, DC: U.S. Government Printing Office.

Stoll, C. (1995). Silicon snake oil. New York: Doubleday.

Szajana, B. (1994). An investigation of the predictive validity of computer anxiety and computer aptitude. Educational and Psychological Measurement, 54(4), 926-934.

Thompson, R. L., Higgins, C. A., & Howell, J. M. (1991). Personal computing: Toward a conceptual model of utilization. MIS Quarterly, 15, 125-143.

Tinto, V. (1975). Dropout from higher education: A theoretical synthesis of recent research. Review of Educational Research, 45, 687-700.

Tinto, V. (1987). Leaving college : Rethinking the causes and cures of student attrition (1st ed.). Chicago: University of Chicago Press.

Tinto, V. (1993). Leaving college: Rethinking the causes and cures of student attrition (2nd ed.). Chicago: University of Chicago Press.

Torkzadeh, G., & Koufteros, X. (1994). Factorial validity of a computer self-efficacy scale and the impact of computer training. Educational and Psychological Measurement, 54(3), 813-821.

Triandis, H. C. (1971). Attitudes and attitude change. New York: Wiley & Sons.

Triandis, H. C. (1980). Values, attitudes, and interpersonal behavior. In H. C. Triandis (Ed.), Nebraska symposium on motivation, 1979: Beliefs, attitudes, and values (pp. 195-259). Lincoln: University of Nebraska Press.

Utah State University mission statement. (1996). [On-line]. Available: http://www.usu.edu/about/.mission.html

Vavra, T. G. (1997). Improving your measurement of customer satisfaction. Milwaukee, WI: ASQ Quality Press.

Von Holzen, R. L. (1993). Effects of group composition and gender on college students' computer knowledge and attitude. Unpublished doctoral dissertation, Texas Tech University, Lubbock.

Webster, J., & Martocchio, J. J. (1992). Microcomputer playfulness: Development of a measure with workplace implications. MIS Quarterly, 16(2) 201-226.

Weighing the case for the network computer. (1997, January 18-24). The Economist, 342(8000) 61-62.

Zeithaml, V. A., Parasuraman, A., & Berry, L. L. (1990) Delivering quality service: Balancing customer perceptions and expectations. New York: Free Press.

APPENDICES

Appendix A

Context and Respondent Characteristics of Computer Assessment Studies

Table A-1

Scope of Computer Assessment Studies

	Author & year	Department	Scope	Level
1	Boettner (1991)	Comp Sci	Computer Concepts	Undergrads
2	Compeau & Higgins (1995)	Bus Admin	Profession	Managers
3	Furst-Bowe et al. (1995-96)	Gen Ed	English 102	Freshmen
4	Dologite et al. (1990-91)	Bus Admin	Intro to Computers	Undergrads
5	Duncan (1990)	CIS	Intro Bus Computer Sys	Undergrads
6	Gabriel (1985b)	Ed Rsrch	Public education	Secondary
7	Geissler & Horridge (1993)	Home Ec	Institution	Undergrads
8	Hilton et al. (1993)	BISE	Intro Bus Applications	Undergrads
9	Ingram et al. (1993)	CS	Intro to CS	Undergrads
10	Kagan & Pietron (1987)	Teacher Ed	Computers in Business	Undergrads
11	Kay (1993a)	Ed Rsrch	Preservice teachers	Undergrads
12	Khan & Jessup (1991)	Business	Basic IS	Undergrads
13	Larson & Smith (1994)	Journalism	Freshman Orientation	Freshmen
14	Loyd & Gressard (1984)	Ed Rsrch	CBI program	Secondary
15	Marcoulides & Xiang-Bo (1990)	Ed Rsrch	Undergrads	Undergrads
16	Martinez & Mead (1988)	Ed Rsrch	Public education	Secondary
17	Maurer & Simonson (1993-1994)	Inst Tech	Computers in Education	Undergrads
18	Mawhinney & Saraswat (1991)	MIS Rsrch	Intro CIS & 2nd CIS	Undergrads
19	Maxam (1993)	BISE	Beginning computers	Secondary
20	Malaney & Thurman (1989)	Stdnt Affair	Undergraduates	Undergrads
21	Norales (1987)	Info Sys	Intro to Info Systems	Undergrads
22	Simonson et al. (1987)	Curric & IT	Intro to Computers	Undergrads
23	Szajana (1994)	Business	Bus Computing	Undergrads
24	Torkzadeh & Kouftero (1994)	Ed Rsrch	Basic Bus Computers	Undergrads
25	Von Holzen (1993)	Inst Tech	Microcomputer Use	Undergrads
26	Wiggs & Huter (1995)	Admin Svcs	Intro to Microcomputers	Undergrads
27	Woodrow (1991)	Math/Sci Ed	Computing Preservice	Undergrads

Appendix B

Microcomputer Studies at the College Level

Table B-1

Categorization of 34 Computer-Related Studies Conducted at the College Level

	Construction method			Terms used		
Author(s) and date	Empirical	Factor analysis	Theory	Computer literacy	Achievement	Use
Boettner (1991)	1			1	1	
Brock, Thomsen, & Kohl (1992)	1			1		
Campbell (1992)			1	1		1
Crable, et al. (1994)			1			1
Davidson et al. (1992)			1		1	
Dologite, Ryan, & Ferns (1990-91)	1			1		1
Duncan (1990)	1			1		
Fann et al. (1988-89)	1		1			1
Furst-Bowe et al. (1995-96)	1		1			1
Geissler & Horridge (1993)	1			1		1
Harrington (1990)	1			1		1
Hignite & Echternacht (1992)	1			1		
Hill et al. (1987)			1			1
Hunt & Bohlin (1993)	1					1
Jones & Wall (1989)	1				1	
Kagan & Pietron (1987)	1		1	1	1	
Kay (1993a)	1	1	1			1
Khan & Jessup (1991)	1			1		
Koslowsky et al. (1990)			1			1
Larson & Smith (1994)	1			1		1
Lee, Pliskin & Kahn (1994)	1			1	1	1
Malaney & Thurman (1989)	1					1
Marcoulides & Xiang-Bo (1990)		1				
Maurer & Simonson (1993-94)	1				1	
Mawhinney & Saraswat (1991)	1		1		1	
McAulay (1993)	1			1		1
Norales (1987)	1					
Omar (1991)	1			1		
Simonson et al., (1987)	1		1	1		
Szajana (1994)		1			1	1
Torkzadeh & Kouftero (1994)	1	1	1			
Von Holzen (1993)	1	1		1		1
Wiggs & Huter (1996)	1				1	
Woodrow (1991)	1	1		1	1	
Totals	27	6	12	17	10	17

Appendix C

Student Outcome Correlations from Astin (1993)

Table C-1

Student Outcomes Positively Related to Students' Self Report of Hours Spent in Various Activities Including Using a Personal Computer

Student outcome	Positively affected by
Self-rated writing ability/dimension of self-concept	Writing courses Having class papers critiqued by instructors Taking essay exams Using a personal computer
Being very well of financially/dimension of life goals	Partying Watching television Using a personal computer
GRE Quantitative & Analytical/dimension of academic development	Self-rating on math ability High school GPA Using a personal computer
Analytical & problem solving skills/ dimension of cognitive development	Studying or homework Math courses Group class projects Honors program Using a personal computer
Writing skills/dimension of cognitive development	Studying or homework Writing courses Having class papers critiqued by instructors Using a personal computer
Business career choice/dimension of career development	Math courses Fraternity or sorority membership Partying Career counseling Using a personal computer

Note. Since the temporal ordering of outcome and involvement measures cannot be precisely determined, causal interpretations should be made with caution. Adapted from *What Matters in College?* by A. W. Astin, 1993.

Appendix D

Questionnaires for Entering Freshman Class at USU

Survey of Entering Freshmen

sponsored by the

Office of Academic Support Services
Utah State University, Logan, Utah

Dear Student:

The information in this form is being collected as part of a continuing study of student development at Utah State University. Your participation in this research is requested in order to achieve a better understanding of how students are affected by their college experiences. This information will guide efforts to create and change programs that serve you. The results of the study will be available through the office of the Vice President of Student Services and Academic Support Services. Identifying information is requested to make subsequent follow-up studies possible. Your response will be held in the strictest professional confidence.

Sincerely

Lavell Saunders
Vice President for Student Services

This first part asks about your goals in attending USU

1. Circle one number for each item to indicate how important each one of the following statements is to you in your decision to go to college.

	NOT AT ALL IMPORTANT	SOMEWHAT IMPORTANT	MODERATELY IMPORTANT	VERY IMPORTANT
a. Learn to perform better under pressure	1	2	3	4
b. Be involved in student activities	1	2	3	4
c. Improve my writing skills	1	2	3	4
d. Explore potential jobs and careers	1	2	3	4
e. Learn to better express ideas	1	2	3	4
f. Improve my study skills	1	2	3	4
g. Obtain a job related to my studies	1	2	3	4
h. Develop money management skills	1	2	3	4
I. Find a lifetime partner	1	2	3	4
j. Make potential business contacts	1	2	3	4
k. Be involved in sports	1	2	3	4
l. Get advice on my goals	1	2	3	4
m. Develop leadership skills	1	2	3	4
n. Be confident about graduating	1	2	3	4
o. Improve communication with friends	1	2	3	4
p. Develop better self understanding	1	2	3	4
q. Develop helping skills	1	2	3	4
r. Improve my computer skills	1	2	3	4

Now, tell us what your expectations are for your first quarter

Indicate your answer to the following questions by checking the choice you believe will be most characteristic of your first quarter. Numbers in parenthesis will be used for processing your answers. They do not carry a value or represent a score.

2. Check the grade that you expect will be your average grade at the end of Fall quarter.

___ A (1) ___ C+ (6)
___ A- (2) ___ C (7)
___ B+ (3) ___ C- (8)
___ B (4) ___ D+ (9)
___ B- (5) ___ D (10)

3. How difficult do you expect your Fall quarter classes will be?

___ Not difficult (1) ___ Moderately difficult (3)
___ Somewhat difficult (2) ___ Very difficult (4)

4. How do you feel about the classes you will be taking Fall quarter.

___ Not excited (1) ___ Moderately excited (3)
___ Somewhat excited (2) ___ Very excited (4)

5. Do you plan to attend USU without interruption?

___ No (1) ___ Yes (2)

If your answer to this question is "No," then check the most applicable reason for the interruption in your schooling.

___ Transfer to another school (1)
___ Volunteer service such as a mission (2)
___ Work (3)
___ Marriage (4)
___ Travel or foreign exchange (5)

___ Other (6): _____

In this section give us your perceptions of USU

6. Circle a number to indicate whether you agree or disagree with the following statements about USU. To answer, use the following scale:

1=Strongly Disagree (SD) 2=Disagree (D) 3=Agree (A) 4=Strongly agree (SA)

	SD	D	A	SA
a. I am confident I made the right decision in choosing to attend Utah State.	1	2	3	4
b. I expect my relationships with other students will have a positive influence on my intellectual growth.	1	2	3	4
c. I believe that most faculty members at Utah State are interested in helping students grow in more than just academic areas.	1	2	3	4
d. I intend to actively seek contacts with my professors.	1	2	3	4
e. I have a clear idea about what I intend to major in.	1	2	3	4
f. I expect to develop a close friendship with at least one faculty member	1	2	3	4
g. I expect to develop close personal relationships with other students	1	2	3	4
h. It is important for me to graduate from Utah State.	1	2	3	4
I. I expect my nonclassroom interactions with faculty members will have a positive influence on my intellectual growth and interests.	1	2	3	4
j. I expect to develop friendships with other students that will be personally satisfying.	1	2	3	4
k. I expect that my nonclassroom interactions with faculty will have a positive influence on my personal growth, values, and attitudes.	1	2	3	4
l. I expect my interpersonal relationships with other students will have a positive influence on my personal growth, values, and attitudes.	1	2	3	4
m. I expect my nonclassroom interactions with faculty will have a positive influence on my career goals and aspirations.	1	2	3	4
n. It will be difficult for me to meet and make friends with other students.	1	2	3	4
o. It is important for me to graduate from college.	1	2	3	4
p. Most faculty members are generally interested in teaching.	1	2	3	4
q. I expect to feel a sense of community and belonging at Utah State.	1	2	3	4
r. I expect my personal values will be challenged in college.	1	2	3	4
s. My family is very supportive of my going to college	1	2	3	4

Next, tell us how you expect to spend your time Fall quarter

7. Estimate the number of hours in an average week you expect you will be doing each of the following:

Indicate your answer by circling a number for each activity.

		Number of hours per week							
		None	<1	1-2	3-5	6-10	11-15	16-20	20+
a.	Studying or doing homework alone	0	1	2	3	4	5	6	7
b.	Using a computer for assignments	0	1	2	3	4	5	6	7
c.	Working with friends on homework	0	1	2	3	4	5	6	7
d.	Talking with teachers outside of class	0	1	2	3	4	5	6	7
e.	Exercising or doing sports	0	1	2	3	4	5	6	7
f.	Playing computer games	0	1	2	3	4	5	6	7
g.	Using a computer to talk to friends/family or make friends	0	1	2	3	4	5	6	7
h.	Activities with friends not related to studies	0	1	2	3	4	5	6	7
I.	Working for pay	0	1	2	3	4	5	6	7
j.	Volunteer work	0	1	2	3	4	5	6	7
k.	Using a library	0	1	2	3	4	5	6	7

These questions ask about library use

Indicate your answer to each question with a check mark. Numbers in parenthesis will be used for processing your answers. They do not carry a value or represent a score.

8. Did you have any introduction to library search strategies in your high school classes?

___ No (1) ___ Yes (2)

9. Have you had any experience with computerized online catalogs?

___ No (1) ___ Yes (2)

10. How well do you feel you understand library research, which means being able to locate information on a topic in a book or in a journal?

___ Not at all (1)
___ Somewhat (2)
___ Moderately (3)
___ Very well (4)

11. How much experience do you have in doing library research, which means locating information on a topic in a book or journal?

___ None at all (1)
___ Some experience (2)
___ Average experience (3)
___ Extensive experience (4)

12. How often did you use a library in your studies before you came to USU?

___ Not at all (1)
___ Once a month (2)
___ Once a week (3)
___ More than once a week (4)

13. Check all the reasons that you use a library.

____ Work on a class assignment
____ Do homework
____ Study with friends
____ Ask for help with a paper
____ Read a book

14. Have you used other university libraries before coming to USU?

___ No (1) ___ Yes (2)

15. Circle a number to indicate whether you agree or disagree with the following statements about library information retrieval. To answer use the following scale:

1=Strongly Disagree (SD) 2=Disagree (D) 3=Agree (A) 4=Strongly agree (SA)

	SD	D	A	SA
a. I know how to use print indexes to find journal articles.	1	2	3	4
b. I know how to use computerized indexes to find journal articles.	1	2	3	4

What is your background in microcomputers?

16. Where and from whom did you **first** learn to use a microcomputer? (check only one)

___ NOT APPLICABLE (haven't yet learned to use a computer) (1)
___ ON MY OWN (no training from anyone) (2)
___ FROM FAMILY (parent, sister, brother, or relation) (3)
___ AT SCHOOL (eiementary, jr. high, middle, or high school) (4)
___ FROM FRIENDS (friends or parent of a friend) (5)
___ AT WORK (training through work or from coworkers) (6)
___ OTHER (7) _____

17. Where and from whom have you learned the **most** about how to use microcomputers? (check one)

___ NOT APPLICABLE (haven't yet learned to use a computer) (1)
___ ON MY OWN (no training from anyone) (2)
___ FROM FAMILY (parent, sister, brother, or relation) (3)
___ AT SCHOOL (elementary, jr. high, middle, or high school) (4)
___ FROM FRIENDS (friends or parent of a friend) (5)
___ AT WORK (training through work or from coworkers) (6)
___ OTHER (7) _____

18. During the past year how often did you use a microcomputer?

___ Not at all (1) ___ Occasionally (2) ___ Frequently (3)

19. Do you or your family own a microcomputer? ___ No (1) ___ Yes (2)
If you or your family owns a microcomputer, please indicate the type. (check all that apply)

____ IBM 286 OR LESS
____ IBM 386
____ IBM 486
____ IBM PENTIUM
____ MAC CLASS
____ MAC II
____ MAC POWER PC
____ DON'T KNOW
____ OTHER _____

These questions ask about computer use

Check all of the following things you can do using a microcomputer.

- ❑ create/change a document
- ❑ use Windows
- ❑ make a copy of a file
- ❑ delete a file from a disk
- ❑ use mail merge for form letters
- ❑ enter data in a spreadsheet
- ❑ write formulas in a spreadsheet
- ❑ enter data in a database
- ❑ use an electronic bulletin board
- ❑ write a program in code
- ❑ use a printer to print a document
- ❑ use a Macintosh operating system
- ❑ install new software to a hard drive
- ❑ access a directory of saved files
- ❑ produce a newsletter
- ❑ teach yourself a software program
- ❑ create graphs from spreadsheet data
- ❑ create functions for a database
- ❑ locate and retrieve info. over Internet
- ❑ change a program someone wrote
- ❑ save a document to a disk
- ❑ rename a file
- ❑ use a word processor
- ❑ produce a résumé
- ❑ use clip art
- ❑ create a new spreadsheet
- ❑ do spreadsheet macros
- ❑ sort and query a database
- ❑ send and receive E-mail
- ❑ test and debug a program

How do you learn new software?

20. Imagine that you were given a new software package for some aspect of work or school. It doesn't matter specifically what this software package does, only that it is intended to make your life easier and that you have never used it before

For each of the following situations, please answer "yes" or "no" according to whether you think you would be able to complete an assignment using the software package. Then, for each question that you answered "yes," please rate your confidence by circling a number from 1 to 10.

I COULD COMPLETE AN ASSIGNMENT USING THE SOFTWARE PACKAGE . . .

		NOT AT ALL CONFIDENT				MODERATELY CONFIDENT					TOTALLY CONFIDENT
a. . . .if there was no one around to tell me what to do as I go.	Yes. . . No	1	2	3	4	5	6	7	8	9	10
b. . . .if I had never used a package like it before.	Yes. . . No	1	2	3	4	5	6	7	8	9	10
c. . . .if I had only the software manual for reference.	Yes. . . No	1	2	3	4	5	6	7	8	9	10
d. . . .if I had seen someone else using it before trying it myself.	Yes. . . No	1	2	3	4	5	6	7	8	9	10
e. . . .if I could call someone for help if I got stuck	Yes. . . No	1	2	3	4	5	6	7	8	9	10
f. . . if someone else had helped me get started	Yes. . . No	1	2	3	4	5	6	7	8	9	10
g. . . .if I had a lot of time to complete the job for which the software was provided.	Yes. . . No	1	2	3	4	5	6	7	8	9	10
h. . . .if I had just the built-in help facility for assistance	Yes. . . No	1	2	3	4	5	6	7	8	9	10
I. . . .if someone showed me how to do it first.	Yes. . . No	1	2	3	4	5	6	7	8	9	10
j. . . .if I had used similar packages before this one to do the same job.	Yes. . . No	1	2	3	4	5	6	7	8	9	10

Finally, we need some information about you

21. Rate yourself on each of the following traits as compared to the average person your age. Give the most accurate estimate of how you see yourself.

	LOWEST 10%	BELOW AVERAGE	ABOVE AVERAGE	HIGHEST 10%
Academic ability	1	2	3	4
Creativity	1	2	3	4
Leadership ability	1	2	3	4
Mathematical ability	1	2	3	4
Computer ability	1	2	3	4
Interpersonal (social) ability	1	2	3	4
Writing ability	1	2	3	4

22. Do you have a scholarship to attend USU?
___ No (1) ___ Yes (2)

If your answer to the previous question was **YES**, give the type of scholarship.

___ Academic achievement (1)
___ Leadership (2)
___ Music or Art (3)
___ Athletic (4)
___ Other (5): _____

23. To the best of your memory, what was your high school GPA? _____

24. To the best of your memory, what was your composite ACT score? _____

25. How many students attended the high school from which you graduated? (Check one)

____ under 100 students (1)
____ 101 to 500 (2)
____ 501 to 1,000 (3)
____ 1,001 to 1,500 (4)
____ 1,501 to 2,000 (5)
____ over 2,000 students (6)

26. What is your residency status? (Check one)
____ Utah resident (1) ____ Non-resident (2)

27. How many miles is Utah State University from your parents' home? (Check one)
___ 5 miles or less (1)
___ 6 to 10 miles (2)
___ 11 to 50 miles (3)
___ 51 to 100 miles (4)
___ 101 to 500 miles (5)
___ Over 500 miles (6)

28. How would you describe your background? (Check one)

___ Rural (1) ___ Suburban (2) ___ Urban (3)

29. Check any disability you have

____ Hearing impaired (1)
____ Vision impairment/Blind (2)
____ Physical mobility impairment (3)
____ Learning disability (4)
____ Disability resulting from head injury (5)
____ Psychiatric disability (6)

____ Other (7) _____ (name)

30. What is your ethnic status?

____ African American (1)
____ Hispanic (2)
____ Asian American (3)
____ Native American (4)
____ Pacific Islander (5)
____ Caucasian (6)

____ Other (7) _____ (name)

31. Indicate the highest level of education your mother and father completed.

MOTHER	FATHER
____ Some high school or less (1)	____ Some high school or less (1)
____ High school graduate (2)	____ High school graduate (2)
____ Some college (3)	____ Some college (3)
____ College graduate w/ 4 yr. degree (4)	____ College graduate w/ 4 yr. degree (4)
____ Masters or Doctorate degree (5)	____ Masters or Doctorate degree (5)

32. What is your age?

___ 17 or younger (1) ____ 18 (2) ____ 19 (3) ____ 20 or older (4)

33. What is your gender? ____Female (1) ____ Male (2)

The results of this research will be reported only in general terms. **No individuals will be identified for any reason.** We are asking for Social Security Number only to enable us to continue the research over time to determine the factors that influence student development.

Print your Social Security Number: __ __ __ - __ __ -__ __ __ __.

THANK YOU

Postassessment Survey of Freshmen

sponsored by the

Office of Academic Support Services
Utah State University, Logan, Utah

Dear Student:

The information in this form is being collected as part of a continuing study of student development at Utah State University. Your participation in this research is requested in order to achieve a better understanding of how students are affected by their college experiences. This information will guide efforts to create and change programs that serve you. The results of the study will be available through the office of the Vice President of Student Services and Academic Support Services. Identifying information is requested to make subsequent follow-up studies possible. Your response will be held in the strictest professional confidence.

Sincerely

LaVell Saunders
Vice President for Student Services

The results of this research will be reported only in general terms. **No individuals will be identified for any reason.** We are asking for Social Security Number only to enable us to continue the research over time to determine the factors that influence student development.

Print your Social Security Number: __ __ __ - __ __ -__ __ __ __.

This first part asks about your goals in attending USU

1. With your first year at USU nearly completed, describe how satisfied you are with your progress toward completing these goals:
Circle a number to indicate your level of satisfaction.
Circle zero (0) if you feel a goal does not apply to you.

	NA	NOT SATISFIED	SOMEWHAT SATISFIED	MODERATELY SATISFIED	VERY SATISFIED
a. Learn to perform better under pressure	0	1	2	3	4
b. Be involved in student activities	0	1	2	3	4
c. Improve my writing skills	0	1	2	3	4
d. Explore potential jobs and careers	0	1	2	3	4
e. Learn to better express ideas	0	1	2	3	4
f. Improve my study skills	0	1	2	3	4
g. Obtain a job related to my studies	0	1	2	3	4
h. Develop money management skills	0	1	2	3	4
I. Find a lifetime partner	0	1	2	3	4
j. Make potential business contacts	0	1	2	3	4
k. Be involved in sports	0	1	2	3	4
l. Get advice on my goals	0	1	2	3	4
m. Develop leadership skills	0	1	2	3	4
n. Be confident about graduating	0	1	2	3	4
o. Improve communication with friends	0	1	2	3	4
p. Develop better self understanding	0	1	2	3	4
q. Develop helping skills	0	1	2	3	4
r. Improve my computer skills	0	1	2	3	4

2. Do you plan to attend USU without interruption? ___ No (1) ___ Yes (2)

- If your answer to this question is "No," then check each of the applicable reasons for the interruption in your schooling.

___ a. Transfer to another school
___ b. Go on a mission or other volunteer service
___ c. Got to work
___ d. Get married
___ e. Travel or go on foreign exchange
___ f. I am dissatisfied with my experience at USU

- If your answer is "No," indicate by entering the appropriate letter (a-f) which of the reasons you checked above is the most important in your decison to interrupt your schooling at USU?_____

- If your answer is "No," do you intend to return to USU after the interruption?

___ Definitely Not (1)
___ Not likely (2)
___ Unsure (3)
___ Probably (4)
___ Definitely (5)

In this section give us your perceptions of your experience at USU

3. Circle a number to indicate whether you agree or disagree with the following statements about USU. To answer, use the following scale:

1=Strongly Disagree (SD) 2=Disagree (D) 3=Agree (A) 4=Strongly agree (SA)

		SD	D	A	SA
a.	I am confident I made the right decision in choosing to attend Utah State.	1	2	3	4
b.	My relationships with other students have had a positive influence on my intellectual growth.	1	2	3	4
c.	I have found most faculty members at Utah State to be interested in helping students grow in more than just academic areas.	1	2	3	4
d.	I have actively sought contacts with my professors.	1	2	3	4
e.	I have a clear idea about what I intend to major in.	1	2	3	4
f.	I have developed a close friendship with at least one faculty member	1	2	3	4
g.	I have developed close personal relationships with other students	1	2	3	4
h.	It is important for me to graduate from Utah State.	1	2	3	4

		SD	D	A	SA
h.	It is important for me to graduate from Utah State.	1	2	3	4
I.	My nonclassroom interactions with faculty members have had a positive influence on my intellectual growth and interests.	1	2	3	4
j.	The friendships I I have developed with other students are personally satisfying.	1	2	3	4
k.	My nonclassroom interactions with faculty have had a positive influence on my personal growth, values, and attitudes.	1	2	3	4
l.	My interpersonal relationships with other students have had a positive influence on my personal growth, values, and attitudes.	1	2	3	4
m.	My nonclassroom interactions with faculty have had a positive influence on my career goals and aspirations.	1	2	3	4
n.	It has been difficult for me to meet and make friends with other students.	1	2	3	4
o.	It is important for me to graduate from college.	1	2	3	4
p.	Most faculty members I have had are genuinely interested in teaching.	1	2	3	4
q.	I feel a sense of community and belonging at Utah State.	1	2	3	4
r.	My personal values have been challenged in college.	1	2	3	4
s.	I am satisfied with my academic experience at USU	1	2	3	4
t.	Few courses this year have been intellectually stimulating	1	2	3	4
u.	My interest in ideas and intellectual matters has increased	1	2	3	4
v.	I am more likely now to attend a cultural event	1	2	3	4
w.	I have performed academically as well as I anticipated	1	2	3	4
x..	My academic experiences have had a positive influence on my intellectual growth and interest in ideas	1	2	3	4
y.	Few of the faculty are genuinely interested in students	1	2	3	4
z..	I am satisfied with the extent of my intellectual development	1	2	3	4
aa.	Few of the students I know would be willing to listen to me	1	2	3	4
bb.	Most students have values and attitudes different from me	1	2	3	4
cc.	I am satisfied with opportunities to meet and interact informally with faculty	1	2	3	4
dd.	Few of the faculty members I have had contact with are generally outstanding or superior teachers	1	2	3	4
ee.	Few of the faculty members I have had contact with are willing to spend time outside of class to discuss issues	1	2	3	4
ff.	I plan to register at USU next Fall Quarter	1	2	3	4

Next, tell us how you are spending your time

2. Estimate the number of hours in an average week during Winter Quarter that you have spent doing each of the following:

Round to the nearest hour. Indicate your answer by circling a number for each activity. Please notice that the number of hours per week is at the head of the column. In answering refer to the numbers at the head of the column. The number you will circle is the column number and not the number of hours per week.

	Number of hours per week							
	No	<1	1-2	3-5	6-10	11-15	16-20	20 +
a. Studying or doing homework by myself	0	1	2	3	4	5	6	7
b. Using a computer for assignments	0	1	2	3	4	5	6	7
c. Working with friends on homework	0	1	2	3	4	5	6	7
d. Talking with teachers outside of class	0	1	2	3	4	5	6	7
e. Exercising or doing sports	0	1	2	3	4	5	6	7
f. Playing computer games	0	1	2	3	4	5	6	7
g. Using a computer to talk to friends/family or make friends	0	1	2	3	4	5	6	7
h. Social activities with friends not related to studies	0	1	2	3	4	5	6	7
I. Working for pay	0	1	2	3	4	5	6	7
j. Volunteer work	0	1	2	3	4	5	6	7
k. Using a library	0	1	2	3	4	5	6	7
l. Participating in clubs/organizations	0	1	2	3	4	5	6	7
m. Participating in intramural sports	0	1	2	3	4	5	6	7
n. Using USU computer network services (E-mail, WWW, chat, VAX, etc.)	0	1	2	3	4	5	6	7
o. Using microcomputers in USU labs	0	1	2	3	4	5	6	7
p. Using microcomputers off campus	0	1	2	3	4	5	6	7
q. Total hours per week using a microcomputer	0	1	2	3	4	5	6	7

These questions ask about library use

Indicate your answer to each question with a check mark. Numbers in parenthesis will be used for processing your answers. They do not carry a value or represent a score.

3. Since attending USU, how well do you feel you understand library research, which means being able to locate information on a topic, in a book, or in a journal?

___ Not at all (1)
___ Somewhat (2)
___ Moderately (3)
___ Very well (4)

4. Since attending USU, how much experience have you had doing library research, which means locating information on a topic in a book or a journal?

___ No experience (1)
___ Some experience (2)
___ Average experience (3)
___ Extensive experience (4)

5. Since being at USU, how often have you used the library in your studies since being at USU?

___ Not at all (1)
___ Once or twice per month (2)
___ Once or twice per week (3)
___ More than twice a week (4)
___ About once per day (5)
___ Several times per day (6)

6. Check all the reasons that you have used the library.

_____ Work on a class assignment
_____ Ask for help with a paper
_____ Do homework
_____ Read a book
_____ Study with friends
_____ Use the computer lab

7. Circle a number to indicate whether you agree or disagree with the following statements about library information retrieval. To answer use the following scale:

1=Strongly Disagree (SD) 2=Disagree (D) 3=Agree (A) 4=Strongly agree (SA)

	SD	D	A	SA
a. I know how to use print indexes to find journal articles.	1	2	3	4
b. I know how to use computerized indexes to find journal articles.	1	2	3	4
c I know how to use computerized online catalogs to find books	1	2	3	4

8. Circle a number to indicate whether you agree or disagree with the following statements about library usage. To answer, use the following scale:

1=Strongly Disagree (SD) 2=Disagree (D) 3=Agree (A) 4=Strongly agree (SA)

	SD	D	A	SA
a. I feel comfortable using a university library.	1	2	3	4
b. I know where to go in the library to find books or journals and magazines.	1	2	3	4
c I know where in the library to go for help.	1	2	3	4

These questions ask about computer use

9. Do have your own microcomputer at USU? ___ No (1) ___ Yes (2)

10. Check all of the following things you can do using a microcomputer.

- ❑ create/change a document
- ❑ use Windows
- ❑ make a copy of a file
- ❑ delete a file from a disk
- ❑ use mail merge for form letters
- ❑ enter data in a spreadsheet
- ❑ write spreadsheet formulas
- ❑ enter data in a database
- ❑ use an electronic bulletin board
- ❑ write a program in code
- ❑ use a printer to print a document
- ❑ use a Macintosh operating system
- ❑ install new software to a hard drive
- ❑ access a directory of saved files
- ❑ produce a newsletter
- ❑ teach yourself a software program
- ❑ create graphs
- ❑ create functions for a database
- ❑ retrieve info. over the Internet
- ❑ change a program someone wrote
- ❑ save a document to a disk
- ❑ rename a file
- ❑ use a word processor
- ❑ produce a résumé
- ❑ use clip art
- ❑ create a spreadsheet
- ❑ do spreadsheet macros
- ❑ query a database
- ❑ send and receive E-mail
- ❑ test and debug a program

11. How many classes do you have this quarter? _____

12. How many credit hours do you have this quarter? _____

13. How many classes did you have Winter Quarter in which microcomputer use was: (Write in the number of classes that fit the category.)

    a. not at all necessary? _____ (1)

    b. helpful, but not required? _____ (2)

    c. required only at the end of the quarter? _____ (3)

    d. required only a couple times per month?_____ (4)

    e. required about once a week? _____ (5)

    f. required every 2-3 days? _____ (6)

    g. required daily? _____ (7)

14. Next quarter, do you plan to take at least one class that requires the use of microcomputers?

    ___ No (1) ___ Yes (2)

15. During Winter Quarter, where have you used microcomputers the most? (Check only one response.)

___ Did not need a microcomputer (1)
___ Off campus at residence (2)
___ Off campus at work (3)
___ In the USU computer labs (4)
___ On campus at residence (5)
___ On campus at work (6)

16. What type of microcomputing access do you most prefer? (Check only one response.)

___ Not to need a microcomputer (1)
___ Off campus at residence (2)
___ Off campus at work (3)
___ In the USU computer labs (4)
___ On campus at residence (5)
___ On campus at work (6)

17. On the days that you used a microcomputer during Winter Quarter, what was the average amount of time you spent each time you used one? (Check only one response.)

___ Not at all (1)
___ Less than 15 minutes (2)
___ 15 to 30 minutes (3)
___ 30 to 60 minutes (4)
___ 1 to 2 hours (5)
___ more than 2 hours (6)

18. When you used a microcomputer during Winter Quarter, how many different software packages/programs did you usually use? (Check only one response.)

___ Only one software package each time (1)
___ Usually two packages each time (2)
___ Three different packages (3)
___ Four or more each time (4)

19. Indicate which computer class(es) you have taken? (Please do not include courses prior to Fall Quarter.)

___ CS 100 (1)
___ BIS 140 (2)
___ Others, please specify (3):_____

How do you learn new software?

20. Imagine that you were given a new software package for some aspect of work or school. It doesn't matter specifically what this software package does, only that it is intended to make your life easier and that you have never used it before

For each of the following situations, please answer "yes" or "no" according to whether you think you would be able to complete an assignment using the software package. Then, for each question that you answered "yes," please rate your confidence by circling a number from 1 to 10.

I COULD COMPLETE AN ASSIGNMENT USING THE SOFTWARE PACKAGE . . .

		NOT AT ALL CONFIDENT				MODERATELY CONFIDENT					TOTALLY CONFIDENT
a. . . .if there was no one around to tell me what to do as I go.	Yes. . . No	1	2	3	4	5	6	7	8	9	10
b. . . .if I had never used a package like it before.	Yes. . . No	1	2	3	4	5	6	7	8	9	10
c. . . .if I had only the software manual for reference.	Yes. . . No	1	2	3	4	5	6	7	8	9	10
d. . . .if I had seen someone else using it before trying it myself.	Yes. . . No	1	2	3	4	5	6	7	8	9	10
e. . . .if I could call someone for help if I got stuck	Yes. . . No	1	2	3	4	5	6	7	8	9	10
f. . . if someone else had helped me get started	Yes. . . No	1	2	3	4	5	6	7	8	9	10
g. . . .if I had a lot of time to complete the job for which the software was provided.	Yes. . . No	1	2	3	4	5	6	7	8	9	10
h. . . .if I had just the built-in help facility for assistance	Yes. . . No	1	2	3	4	5	6	7	8	9	10
I. . . .if someone showed me how to do it first.	Yes. . . No	1	2	3	4	5	6	7	8	9	10
j. . . .if I had used similar packages before this one to do the same job.	Yes. . . No	1	2	3	4	5	6	7	8	9	10

Finally, we need some information about you

21. Rate yourself on each of the following traits as compared to the average person your age. Give the most accurate estimate of how you see yourself.

	LOWEST 10%	BELOW AVERAGE	AVERAGE	ABOVE AVERAGE	HIGHEST 10%
Academic ability	1	2	3	4	5
Creativity	1	2	3	4	5
Leadership ability	1	2	3	4	5
Mathematical ability	1	2	3	4	5
Computer ability	1	2	3	4	5
Interpersonal (social) ability	1	2	3	4	5
Writing ability	1	2	3	4	5

22. To the best of your memory, what was your high school GPA? _____

23. To the best of your memory, what was your composite ACT score? _____

24. What is your residency status? (Check one)

    ____ Utah resident (1) ____ Non-resident (2)

- If you are a nonresident of Utah, do you intend to apply for residency

    ____ No (1) ____ Yes (2)

25. Do you intend to participate in the University Honors Program ___ No (1) ___ Yes (2)

26. Are you taking one or more honors classes Spring Quarter ___ No (1) ___ Yes (2)

27. How many campus clubs or organizations do you currently belong to? _____

28. Currently, how far do you live from Utah State? (Check only one response.)

    ___ on campus (1)
    ___ less than a mile (2)
    ___ 1-5 miles (3)
    ___ 6-10 miles (4)
    ___ 11-20 miles (5)
    ___ 21-50 miles (6)
    ___ more than 50 miles (7)

65. Where do you live? (Check all of the appropriate answers.)

___ At home with parents (1)
___ In a university residence hall for single students (2)
___ In off-campus housing for singles (3)
___ In a sorority or fraternity house (4)
___ with a spouse or partner (5)

___ Other (please specify) _____

29. Check any disability you have

_____ Hearing impaired (1)
_____ Vision impairment/Blind (2)
_____ Physical mobility impairment (3)
_____ Learning disability (4)
_____ Disability resulting from head injury (5)
_____ Psychiatric disability (6)

_____ Other (7) _____ (name)

30. What is your ethnic status?

_____ African American (1)
_____ Hispanic (2)
_____ Asian American (3)
_____ Native American (4)
_____ Pacific Islander (5)
_____ Caucasian (6)

_____ Other (7) _____ (name)

31. What year did you graduate from high school? 19_____

32. What is your age?

___ 17 or younger (1) ____18 (2) ____ 19 (3) ____ 20 (4)

___ 21 (5) ___ 22 (6) ____ 23 (7) ____ 24 (8) ___ 25 or older (9)

33. What is your gender? ____Female (1) ____ Male (2)

THANK YOU

Appendix E

Sources and Rationale for Variables Selected for Survey of USU Freshmen

Table E-1

Sources and Rationale for Variables Selected for Survey of USU Freshmen

*	Item or Scale	Source	Description	Rationale for inclusion
*	Student Goals Inventory (SGI) (items 1a-r)	Calder (1993)	Items (18) assess academic, career, and personal goals' importance and satisfaction with progress toward completing.	Goal satisfaction is a measure of personal development (Tinto, 1980).
*	Average grade for Fall Qtr. (item 2)	Original demographic	One item self-reports expected and actual grades.	Indicator of academic development
	Difficulty of Fall Qtr. classes (item 3)	1995 USU Orientation evaluation	One item reports expected difficulty and later the perceived difficulty of classes	Indicator of affective development
	Excitement level about classes (item 4)	1995 USU Orientation evaluation	One item reports feelings relative to classes	Indicator of affective development
	Plans to attend USU w/out interruption (item 5)	1995 USU Orientation evaluation	Four items report plans to voluntarily interrupt education	Indicator of student's persistence with university studies.
*	Measure of Academic and Social Integration (item 6 a-v)	Pascarella & Terenzini (1980)	Items assess peer-group interaction (7), faculty interaction (6), perceived faculty concern (3), and institutional commitment (6)	Provides data on dimensions of personal and intellectual development per Tinto's (1993) model.
*	Number of hours/ week involved in selected activities (item 7 a-q)	Adapted from Astin (1993)	Items report expected (11) and self-report actual (17) time involvement.	Astin's (1990) variables are consistent indicators of student development dimensions.
	Library background and current use. (item 8-15 pre & 8-13 post)	Betty Dance and USU library staff	Items measuring library research experience and use.	Indicator of library-related microcomputer use.
	Microcomputer first learned and most learned (item16-17 pre)	Adapted from Martinez & Mead (1988)	Two items reporting background of microcomputer learning.	Demographics, identifies those with no background, school-taught, and self-taught
*	Frequency microcomputer use-year/ week (item 18 pre)	CIRP survey (Sax et al., 1995) & Astin (1993)	One item on microcomputer use in past year: frequent, occasional, or not at all.	Demographic, for comparison to CIRP data for nationwide freshman microcomputer use.

(table continues)

* Variables used to elaborate the assessment model.

*	Item or Scale	Source	Description	Rationale for inclusion
	Microcomputer ownership background (item 19 pre & item 14 & 24 post)	Kay (1993b)	Eleven items report ownership and type(s) of microcomputer owned	Demographics on students' past access to microcomputers.
	Classes/micro-computer use (item 16-18 post)	Original demographic	Four items report total class load, number, and which classes that require microcomputer use.	Demographic to show influence of class-induced use of microcomputers on dimensions of development.
*	Microcomputer use/Fall Qtr. (item 20-22 post)	Adapted from Thompson et al. (1991)	Three items report microcomputer use frequency, intensity, and breadth	Frequency, intensity, and breadth are established dimensions of microcomputer use (Thompson et al., 1991).
	USU computer network access (item 24 post)	Original demographic	Single item dichotomizes student access as on or off campus.	Demographic to show influence of access on student development
*	Tasks respondent can do using a microcomputer (item20 pre & 15 post)	Furst-Bowe et al. (1995-1996)	Students check Items (30) to indicate which tasks they can do using a microcomputer.	Responses grouped by software types will show how types of microcomputer use correspond to dimensions of development.
*	Computer Self-Efficacy Measure (item20 p. 4 pre & 25 post)	Compeau and Higgins (1995)	Scale of 20 items measures confidence in learning a new software given varying conditions	Computer self-efficacy has been shown to relate positively to microcomputer use.
*	Ability self-rating (item 21a pre & 26 post)	CIRP survey (Sax et al., 1995)	Scale asks student to rate themselves in seven ability areas compared to the average person their age.	Serves as a student development outcome in Astin's model.
*	Measures of past performance (item 21-24 pre & 27-28, 30-32 post)	Astin (1993) and Sax et al. (1995)	Self-report on High school GPA, ACT score, scholarship.	Serves as a student development outcome in Astin's model.
	Geographic variables (item 25-28 pre & 33-34 post)	Astin (1993)	Self-report of residency, location of residence	Demographic to show influence of access on development and microcomputer use
	Parents' education (item 31 pre)	Astin (1993) and Sax et al. (1995)	Self-report of parents' education.	Demographic to show influence of parent education

* Variables used to elaborate the assessment model.

*	Item or Scale	Source	Description	Rationale for inclusion
	Personal variables (item 29-30, 32-33 pre & 35-39 post)	Standard demographics	Gender, age, ethnic status, disability.	Demographic to show influence of background on development and microcomputer use.

* Variables used to elaborate the assessment model.

Appendix F

Data Types, Coding, and Statistical Analysis for Variables Selected for Survey of USU Freshmen

Table F-1

Data Types, Coding, and Statistical Analysis for Variables Selected for Survey of USU Freshmen

Item or scale	Type of data	Coding		Research question (RQ) and analyses
[a] Student Goals Inventory (SGI) (items 1a-r)	Ordinal	Pre: 0	No Response	RQ 4--frequencies and percentages
		1	Not at All Important	
		2	Somewhat Important	
		3	Moderately Important	RQ 6--correlations, factor analysis, and multiple regression
		4	Very Important	
		Post: 0	Does Not Apply	
		1	Not Satisfied	
		2	Somewhat Satisfied	
		3	Moderately Satisfied	
		4	Very Satisfied	
[a] Average grade for Fall Qtr. (item 2)	Ordinal	0	No Response	RQ 5---frequencies and percentages
		1	A	
		2	A-	
		3	B+	RQ 7--correlations, factor analysis, and multiple regression
		4	B	
		5	B-	
		6	C+	
		7	C	
		8	C-	
		9	D+	
		10	D	
Difficulty of Fall Qtr. classes (item 3)	Ordinal	1	Not Difficult	
		2	Somewhat Difficult	
		3	Moderately Difficult	
		4	Very difficult	
Excitement level about classes (item 4)	Ordinal	1	Not Excited	
		2	Somewhat Excited	
		3	Moderately Excited	
		4	Very Excited	
Plans to attend USU w/out interruption (item 5)	Nominal	1	No	
		2	Yes	
[a] Measure of Academic and Social Integration (item 6 a-v)	Ordinal	1	Strongly Disagree (SD)	RQ 5---frequencies and percentages
		2	Disagree (D)	
		3	Agree (A)	
		4	Strongly agree (SA)	RQ 6 and RQ 7--correlations, factor analysis, and multiple regression

(table continues)

[a] Item or scale	Type of data	Coding	Research question (RQ) and analyses
[a] Number of hours/ week involved in selected activities (item 7 a-q)	Ordinal	0 None 1 <1 Hour per Week 2 1 to 2 Hours per Week 3 3 to 5 Hours per Week 4 6 to 10 Hours per Week 5 11 to 15 Hours per Week 6 16 to 20 Hours per Week 7 20+ Hours per Week	RQ 2--frequencies and percentages RQ 6 and RQ 7--correlations, factor analysis, and multiple regression
Library background and current use. (item 8-15 pre & 8-13 post)	Nominal	1 No 2 Yes	
	Ordinal	0 No Response 1 Not at All 2 Somewhat 3 Moderately 4 Very Well	
		0 No Response 1 No Experience 2 Some Experience 3 Average Experience 4 Extensive Experience	
Microcomputer first learned and most learned (item16-17 pre)	Nominal	0 No Response 1 Not Applicable 2 On My Own 3 From Family 4 At School 5 From Friends 6 At Work 7 Other	
[a] Frequency microcomputer use-year/ week (item 18 pre)	Ordinal	0 No Response 1 Not at All 2 Occasionally 3 Frequently	RQ 2--frequencies and percentages RQ 6 and RQ 7--correlations, factor analysis, and multiple regression
Microcomputer ownership background (item 19 pre & item 14 & 24 post)	Nominal	1 No 2 Yes	
Classes/micro-computer use (item 16-18 post)	Nominal	0 No Response 1 Not Marked 2 Marked	

(table continues)

[a] Item or scale	Type of data	Coding	Research question (RQ) and analyses
[a] Microcomputer use (item 20-22 post)	Ordinal	Post: 1 Not at All 2 Once or Twice per Month 3 Once or Twice per Week 4 Three or Four Times/Week 5 About Once per Day 6 Several Times per Day 1 Not at All 2 Less than 15 Minutes 3 15 to 30 Minutes 4 30 to 45 Minutes 5 1 to 2 Hours 6 More Than 2 Hours 1 Only One Software Pkg. 2 Usually Two Packages 3 Three Packages 4 Four or More Each Time	RQ 2--frequencies and percentages RQ6 and RQ 7--correlations, factor analysis, and multiple regression
USU computer network access(item 24 post)	Nominal	Post: 1 No 2 Yes	
[a] Tasks respondent can do using a microcomputer (item20 pre & 15 post)	Nominal	0 No Response 1 Not Marked 2 Marked	RQ 1--frequencies and percentages RQ6 and RQ 7--correlations, factor analysis, and multiple regression
[a] Computer Self-Efficacy Measure (item20 p. 4 pre & 25 post)	Nominal Interval	1 No 2 Yes 1 Not At All Confident 2 3 4 5 Moderately Confident 6 7 8 9 10 Totally Confident	RQ 3--frequencies and percentages RQ6 and RQ 7--correlations, factor analysis, and multiple regression

(table continues)

[a] Item or scale	Type of data	Coding	Research question (RQ) and analyses
[a] Ability self-rating (item 21a pre & 26 post)	Ordinal	Pre: 1 Lowest 10 % 2 Below Average 3 Above Average 4 Highest 10% Post: 1 Lowest 10 % 2 Below Average 3 Average 4 Above Average 5 Highest 10%	RQ 4 and RQ 5--frequencies and percentages RQ6 and RQ 7--correlations, factor analysis, and multiple regression
[a] Measures of past performance (item 21-24 pre & 27-28, 30-32 post)	Nominal	1 No 2 Yes 1 Academic Achievement 2 Leadership 3 Music or Art 4 Athletic 5 Other	RQ 5--frequencies and percentages RQ6 and RQ 7--correlations, factor analysis, and multiple regression
Geographic variables (item 25-28 pre & 33-34 post)	Ordinal	1 Under 100 Students 2 101 TO 500 3 501 TO 1000 4 1001 TO 1500 5 1501 TO 2000 6 OVER 2000 Students 0 No Response 1 5 Miles or less 2 6 to 10 Miles 3 11 to 50 Miles 4 51 to 100 Miles 5 101 to 500 Miles 6 Over 500 Miles	
	Nominal	0 No Response 1 Utah Resident 2 Non-resident 0 No Response 1 Rural 2 Suburban 3 Urban	

(table continues)

[a] Item or scale	Type of data	Coding	Research question (RQ) and analyses
Parents' education (item 31 pre)	Ordinal	1 Some High School or less 2 High School Graduate 3 Some College 4 Graduate w/4 yr. Degree 5 Masters or Doctorate	
Personal variables (item 29-30, 32-33 pre & 35-39 post)	Nominal	1 Hearing Impaired 2 Vision Impaired/blind 3 Physical Mobility 4 Learning Disability 5 Disability/headinjury 6 Psychiatric 7 Other	
		1 African American 2 Hispanic 3 Asian American 4 Native American 5 Pacific Islander 6 Caucasian	
	Interval	Pre: 1 17 or Younger 2 18 3 19 4 20 or Older	
		Post: 1 17 or Younger 2 18 3 19 4 20 5 21 6 22 7 23 8 24 9 25 or Older	
		1 Female 2 Male	

[a] Variables used to elaborate the assessment model

Appendix G

Preliminary Data from 1996 Freshman Class--USU

Obtained September, 1996

Survey of First-time Entering Freshmen
By Frequency of Microcomputer Use
Fall 1996

Objective: Prior to entering the university, freshmen completed questionnaires aimed at measuring student development at Utah State University (USU). Student use of microcomputers was emphasized as one aspect of student development.

Conducted by: Lavell Saunders, Assistant Vice President for Student Services and Dan Judd, doctoral student BISE

Population: 1,930 first-time, full-time USU freshmen

Sample: 1,250 first-time, full-time USU freshmen

Return rate: 80.6%

Gender: 35% male

To obtain a sample prior to the beginning of Fall Quarter, the freshmen class of USU was divided Tinto two groups, those attending an orientation class prior to the official start of the quarter and those not registered for orientation. Questionnaires were mailed to 590 incoming freshmen not registered for the class. Of those, 280 (47%) returned the questionnaire. The remainder of the questionnaires were filled out by 935 freshmen attending the freshman orientation, "Survival 96," and 35 incoming athletes attending an orientation class. A total of 1,250 surveys were returned which represents responses from 65% of the full-time, first-time entering freshmen.

Incoming freshmen were first asked about their goals in attending USU. Of highest importance to all students are issues of future employment

72% consider it very important to obtain a job related to their studies.
71% consider it very important to explore potential jobs and careers.
60% consider it very important to improve their study skills.
51% consider it very important to develop better self understanding.
50% consider it very important to improve their computer skills.

Students were asked how often in the past year they used a microcomputer. Students reporting that they used a computer frequently in the past year make up 48% (n=604) of the sample. Occasional users make up 42% (n=524) and those reporting that they did not use a computer at all over the past year are approximately 10% (n=116) of the sample. This question served as a means of dividing the sample and looking at students' differences.

Demographically these frequency-of-use groups differed most strikingly in age. From the data, it appears that older freshmen used microcomputers less in the year prior to entering the university. Twenty-four percent of those reporting that they used a microcomputer not at all during the past year were 20 years of age or older. This contrasts with the other two groups, reporting occasionally and frequently using a microcomputer in the past year, in which freshmen 20 years or older made up 7% and 4%, respectively.

When gender is considered, the makeup of these three frequency-of-use groups does not differ more than 5% in the percentage of males or females between the groups.

Besides demographics, the groups showed differences throughout the survey. The survey first asked about expectations. As an example of a difference in expectations, 59% of those students who used a microcomputer frequently in the past year expected that their average grade for the quarter would be an A or A-. Whereas, 46.5% of those students who reported occasionally using a microcomputer carried the same expectation. In the group that did not use a microcomputer at all in the past year, 36% of the freshmen expected an average grade of an A or A- for the quarter.

Another difference between subgroups distinguished by frequency of microcomputer use was in students' conception of a major. Of those reporting frequent use of the microcomputer in the past year, 72% agreed with the statement " I have a clear idea of what I intend to major in." Whereas, 60% of occasional users and 59% infrequent users agreed with the statement.

Also, the group of users who report using microcomputers not at all in the past year hold lower expectations of being influenced by faculty in positive ways outside of class. This group of users exhibit 10% greater disagreement with statements expressing the expectation that nonclass interaction with faculty will influence their intellectual growth, personal growth, values, and attitudes.

Of those students that report using microcomputers frequently in the past year, 77% anticipate using a computer more than 3 hours per week. Within that same group of frequent users, 46% anticipate using a computer more than 5 hours per week.

One of the strongest associations with frequent microcomputer use is students' library use. For the question "did you have any instruction in library search strategies in your high school" there is a 20% difference in the number of frequent users contrasted with the nonusers answering "yes." That is, 79% of the frequent users answered this question "yes," whereas only 59% of the nonusers answered positively. For another question, "have you had experience with computerized online catalogs," the difference between frequent and occasional users doubles. There is a 40% difference between the two groups. Of those reporting they used computers not at all in the past year, only 24% received any experience in online catalogs while in high school. This contrasts with the frequent user group, nearly 80% of this group said they had experience with online catalogs.

In response to the question, "do you or your family own a microcomputer," nearly 80% of the sample answered "yes." By group, 93% of frequent users answered "yes" to this question, 76% of occasional answered "yes," and only 26% of the infrequent users. Of those who own microcomputers, 20% own 286s or 386s, 38% own 486s or Pentiums, 10% own Macs, and 32% don't know..

In response to a request that students indicate which tasks they can do using a microcomputer there were differences depending on students' frequency of use. A table summarizes the skill differences between groups of students divided according to how often they used a microcomputer in the last year. The following percentages are for the number of students in each group who indicate that they are able to do the task:

	Not at all	Occasionally	Frequently
make a copy of a file	31%	64%	83%
access directory of saved files	31%	79%	91%
use Windows	43%	89%	95%
send and receive E-mail	17%	37%	56%
install new software	20%	26%	51%
locate and retrieve info over the Internet	16%	29%	52%
create a new spreadsheet	19%	37%	52%
create graphs from spread sheet data	13%	24%	45%
enter data into a database	12%	24%	47%
write a program in code	5%	8%	12%

A measure of computer self-efficacy asked students to rate their confidence in learning new software given a variety of conditions. All freshmen expressed the greatest confidence in the situation where someone would show him/her "how to do it first." Confidence was nearly as high if she/he "had used similar packages like it before."

Frequency-of-use groups show differences in computer self-efficacy. The survey contained 10 questions that measured computer self-efficacy. All questions dealt with learning a new software program and presented a scenario for doing so such as "if I had only the software manual for reference," or "if I had used similar packages before this one to do the same jobs." As would be expected, those who used microcomputers less often reported having less confidence in most situations. One exception was "if I had never used a package like it before," in this situation those freshmen who reported less frequent use of microcomputers showed a higher level of confidence than students who used microcomputers frequently in the past year.

This survey will be modified and administered again at the end of Fall Quarter and at the end of Spring Quarter to determine what effect the USU environment has had on the development and microcomputer use of incoming freshmen. For a copy of the questionnaire or to submit suggestions contact Dan Judd at 7-0091.

Appendix H

Preliminary Approval

January 3, 1997

Daniel R. Judd
Doctoral Student BISE
Utah State University
Logan, UT 84335-6581

Dear Dan:

Re: Official Authorization to Obtain Data from the USU Aggie Express System.

As Acting Vice President for Student Services, I support the survey of 1996 freshman students that you and Dr. Saunders are working on. I understand that this study also involves your doctoral research of student development and use of the microcomputers.

For the purposes of your study, this letter gives my official authorization for you to obtain the lab use information you need from the USU Aggie Express system. I understand from Karl Fugal that he can match students' social security number with a record of the number of times a student used any of the microcomputer labs.

I wish you well in this research and in your doctoral program.

Sincerely,

(original with signature available)

Lynn J. Poulsen
Acting Vice President for Student Services
Utah State University

Appendix I

Factor Analysis of Data Obtained Using

Furst-Bowe et al. (1995-1996)

As means of reducing the amount of data reported, a factor analysis was performed with data supplied by the checklist adapted from Furst-Bowe et al. (1995-1996). Data from 19 items for which longitudinal data existed were included in the factor analysis.

Unlike the original grouping of variables presented by Furst-Bowe et al. (1995-1996) which was based on a logical grouping of skills. The factor analysis performed for this study sought to create groups of skills according to the amount of change that occurred during freshmen's first academic year at USU. Individual change caused variation. To record changes occurring during students' first academic year attending USU, dichotomous data for these variables were recoded into a three point scale: If in the fall the student said they could perform the skill, but in the spring they indicated that they could not do the activity then they were coded -1. If they indicated that they could either do or not do a skill and that was the same in the spring, they were coded a 0: 0=no change. If students indicate that they were not able to do a skill prior to entering USU, but in the spring indicated that they could that was coded as a 1. A table displaying how factors loaded using this data is found in appendix S. This factor analysis produced six factors. The factors obtained are similar to Furst-Bowe et al. (1996):

1. Spreadsheet and database skills
2. Programming skills
3. Internet skills
4. Basic computer skills
5. Graphics skills
6. Word processing skills

The following table demonstrates how the six factors loaded:

Table I-1

Summary of Microcomputer Skill Variables Recording Changes Occurring in a Sample of USU Freshman Between August 1996, Prior to Entering USU, and Spring Quarter 1997

	Factors					
	1	2	3	4	5	6
Spreadsheet and database skills						
Enter data in spreadsheet	.8095					
Create a spreadsheet	.7815					
Enter data in existing	.7393					
Create graphs from data	.6996					
Sort and query a database	.6789					
Do spreadsheet macros	.6378					
Write spreadsheet formulas	.6304					
Create functions for a	.5138					
Programming skills						
Change a program someone		.7751				
Write a program in code		.7538				
Test and debug a program		.7348				
Internet skills						
Retrieve info over the			.8540			
Send and receive E-mail			.7984			
Basic skills						
Save a document to disk				.7592		
Make a copy of a file				.7097		
Graphics skills						
Use an electronic bulletin					.7534	
Use a Macintosh					.5821	
Word processing skills						
Produce a résumé				.5604		.4087
Use mail merge for form						.8615

Appendix J

Change in Ability to Do a Computer Skill

As the analysis of FTFT freshman microcomputer use change continues, the means for paired samples are submitted to a *t*-test of statistical significance. The purpose of this procedure is to test the null hypothesis that there is no statistically significant difference between the sample of students' ability to carry out certain activities on a microcomputer before attending USU and after attending USU for several quarters. The null hypothesis is that the difference between the mean for the number of computer skills obtained prior to students' entering USU and the mean obtained during Spring Quarter is zero. If the observed significance level is judged small enough, then the null hypothesis is rejected (SPSS, 1988). An assumption of the t-test is a normal distribution. In this case, the distribution is of means

Table J-1

Mean Difference Indicating Change in Ability to Do a Computer Skill

	Paired Differences (95% CI, df = 395)		
Computer skills	M diff	SE of M	t value
Basic skills			
Save a document to a disk	0.0253	0.016	1.58
Use a Macintosh operating system	0.2071	0.031	6.71
Make a copy of a file	0.1843	0.026	7.1
Word processing skills			
Produce a résumé	0.1212	0.025	4.94
Use mail merge for form letters	0.1162	0.026	4.53
Spreadsheet skills			
Enter data in a spreadsheet	0.1086	0.032	3.41
Create a new spreadsheet	0.2121	0.03	7.09
Write formulas in a spreadsheet	0.1515	0.028	5.32
Do spreadsheet macros	0.1515	0.027	5.64
Database skills			
Enter data in an existing database	0.2247	0.031	7.28
Create functions for a database	0.2172	0.026	8.45
Sort and query a database	0.2576	0.028	9.16
Graphics skills			
Create graphs from data	0.303	0.032	9.49
Information retrieval skills			
Send and receive E-mail	0.5404	0.027	20.16
Use an electronic bulletin board	0.1288	0.023	5.61
Retrieve info. over the Internet	0.5	0.028	17.83
Programming skills			
Write a program in code	0.053	0.019	2.81
Test and debug a program	0.0859	0.022	3.97
Change an existing program	0.0404	0.024	1.71

Appendix K

Factor Matrix of Student Integration

Table K-1

Rotated Factor Matrix Using Pascarella and Terrenzini's Measure of Student Integration (1980)

Factor	Factor loading
Interactions with Faculty	
Nonclassroom interactions with faculty positive influence on personal growth, attitudes and values.	0.77020
Nonclassroom interactions with faculty a positive influence on career goals and aspirations.	0.76000
Developed a close friendship with at least one faculty member.	0.72297
Nonclassroom interactions with faculty positive influence on intellectual growth.	0.72
I am satisfied with the opportunities to meet and interact informally with faculty members	0.61994
I have actively sought contacts with my professors	0.56465
I have a clear idea about what I intend to major in	0.44513
Most faculty members at USU are interested in helping students grow in more than just academic areas.	<.35
Peer-Group Interactions	
Student friendships personally satisfying.	0.81413
Relationships with other students a positive influence on personal growth, values and attitudes.	0.75218
Develop close personal relationships with other students.	0.72267
Relationships with other students a positive influence on intellectual growth.	0.60129
It has been difficult to meet and make friends (reverse coded)	0.59616
Most students at USU have values and attitudes different from my own (reverse coded)	<0.35
Academic and Intellectual Development	
My academic experience has had positive influence on my intellectual growth and interest in ideas.	0.76441
Satisfied with the extent of intellectual development	0.71831

(table continues)

Factor	Factor loading
Satisfied with academic experience at USU	0.69229
I have performed academically as well as I anticipated	0.60396
Interest in ideas and intellectual matters has increased	0.58
I am more likely to attend a cultural event	0.57860
Most faculty members are genuinely interested in teaching.	<0.35
Faculty concern for student development and teaching	
Few of the faculty members are willing to spend time outside of class to discuss issues of interest and importance to students. (reverse coded)	0.80760
Few of the faculty members are generally outstanding or superior teachers. (reverse coded)	0.78250
Few of the faculty members are genuinely interested in students. (reverse coded)	0.77799
Few of the students I know would be willing to listen to me and help me if I had personal problems. (reverse coded)	0.72
Few courses this year have been intellectually stimulating (reverse coded)	0.58
Institutional and Goal Commitments	
It is important for me to graduate from USU	0.76378
I plan to register at USU next Fall Quarter	0.71480
Confident I made the right decision	0.53688
It is important for me to graduate from college	<0.35

Appendix L

Correlations Between Change in the Number of Computer Skills and Social Development Factors

Table L-1

Correlations Between Change in the Number of Computer Skills Measured Prior to Entering USU and During Spring Quarter, and Three Social Development Factors

	Social development factors		
Computer skills	Faculty Interaction	Peer Interaction	Institutional Concern
Save document to a disk	0.01	0.01	-0.04
Use a Macintosh operating system	-0.05	-0.07	0.01
Make a copy of a file	-0.01	0.09	-0.07
Produce a résumé	-0.09	0.03	0.02
Use mail merge for form letters	0.05	-0.03	0.04
Enter data in a spreadsheet	0.04	0.09	-0.12
Create a spreadsheet	0.06	0.09	-0.07
Write spreadsheet formulas	-0.03	0.00	-0.05
Do spreadsheet macros	0.00	0.03	-0.05
Enter data in an existing database	0.10*	0.12*	-0.09
Create functions for a database	-0.01	0.03	-0.08
Sort and query a database	0.02	0.01	-0.07
Create graphs from data	0.01	0.07	-0.09
Send and receive E-mail	0.04	0.08	-0.08
Use an electronic bulletin board	0.02	-0.09	0.05
Retrieve information over the Internet	0.02	0.06	-0.06
Write a program in code	0.06	-0.08	-0.02
Test and debug an program	0.08	-0.09	-0.01
Change a program someone wrote	0.01	-0.04	0.05

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

Appendix M

Comparison of Computer Skills Between Entering USU Freshmen

and Freshmen and UW Stout

Table M-1

Mean Percentages for Microcomputer Variables Comparing a Sample of 1996 USU Freshmen to Second Semester 1994 Freshmen at UW-Stout

	1996 USU longitudinal sample n = 400	1994 UW-Stout sample n = 157
Computer skill	% Positive	% Positive
Basic skills		
Use Windows	90.0	78.0
Make a copy of a file	70.5	63.0
Install new software	39.0	34.0
Use Macintosh operating system	35.0	61.0
Teach yourself a new program	35.0	48.0
Mean percentage	53.9	56.8
Word processing skills		
Produce a résumé	72.3	75.0
Produce a newsletter	50.8	72.0
Use mail merge	32.0	47.0
Mean percentage	51.7	73.5
Spreadsheet skills		
Enter data in a spreadsheet	48.8	55.0
Create a new spreadsheet	41.0	48.0
Formulas in a spreadsheet	30.5	35.0
Do spreadsheet macros	20.0	20.0
Mean percentage	35.1	39.5
Database skills		
Enter data into existing database	37.0	55.0
Sort and query a database	20.0	21.0
Functions for a database	14.5	23.0
Mean percentage	23.8	38.0
Graphics skills		
Use clip art	56.8	40.0
Create graphs from data	34.3	38.0
Mean percentage	45.6	40.0
Information retrieval skills		
Send and receive E-mail	42.0	47.0
Retrieve info. over Internet	37.5	35.0
Electronic bulletin board	14.3	23.0
Mean percentage	31.3	41.0
Programming		
Write a program in code	8.5	32.0

This table shows that the highest percentage of entering students report being able to perform skills in the categories of basic skills, word processing, and graphics. This table also shows that a higher percentage of students at the Wisconsin campus report ability in all categories, except graphic skills. However, the comparison to UW-Stout may not be entirely appropriate, freshmen at UW-Stout may have more skills because they had a semester of experience at the university, while data for USU freshmen was obtained before they entered the university. In addition, UW-Stout is an institution which promotes "modern learning technologies and equipment" (Furst-Bowe et al., 1995-1996, p. 175), and freshmen may have been admitted because they had acquired advanced computing skills. The percentage of students reporting an ability to do programming (32%) supports this.

Appendix N

USU Computer Lab Entry Data

Data in Table N-1 for the number of times students in the longitudinal study (n = 400) entered USU computer labs were obtained from USU Computer Services. Before examining those data, however, it will be helpful to know what percentage of the students reported using the USU computer labs. Spring Quarter students were asked to report where, during the academic year, they used microcomputers the most. All 400 freshmen in the longitudinal study answered this question. Table N-1 presents the results.

Table N-1

Percentages of USU Freshmen Reporting Where They Most Often Use PCS or Microcomputers

Do not need	Off campus residence	Off campus work	Computer labs	On campus residence	On campus work
.8%	12.8%	2.0%	63.8%	19.3%	1.3%

This table shows that a majority (63.8%) of freshmen in the study reported that they most often used microcomputers in the USU computer labs. The next largest percent (19.3%) of students used computers on campus at a residence. While the lab use data cannot be assumed as valid for all freshmen in the sample, the fact that such a large percent reported that they mainly used the USU computer labs encourages further investigation.

Lab use data was provided by Computer Services for 388 of the 400 freshmen in the longitudinal sample. Computer Services lab use data provides the number of times the sample of freshmen entered labs fall, winter, and spring quarters during the 1996-1997 academic year, and is summarized in Table N-2.

Table N-2

Average Entries Into USU Computer Labs During Academic Year 1996-1997

	Entries Into USU computer labs (n = 388)					
Time period	M	SD	Median	Mode	Minimum	Maximum
Fall quarter	22.5	21.1	18.0	1.0	0.0	150.0
Winter quarter	22.1	23.8	17.0	0.0	0.0	164.0
Spring quarter	23.0	23.4	16.0	0.0	0.0	142.0
Average for three quarters	22.5	19.7	17.2	6.7	0.3	128.0
Cumulative for three quarters	67.6	59.2	51.5	20	0.0	384.0

Table N-2 shows that each quarter the average number of times that freshmen in the sample entered the USU computer labs was about 22.5 and the difference in quarterly averages is less than one time. Table X also shows that the distribution of entries is strongly skewed toward higher frequency of use. Skewness is evident in several statistics, standard deviations for all the means are high, indicating wide variation in the number of times freshmen used computer labs. Also, medians for the three academic quarters are lower than the means and range from 16 to 18. Although, mean usage is about 22 times per quarter the mode for each quarter is very low, in fact, for Winter and Spring Quarter it is 0. Finally, the range for the summed total number of times freshmen reported using USU computer labs during the academic year, had a minimum of 0 and a maximum of 384. While variation in lab use data affects the confidence in this estimate of the average number of times freshmen used a microcomputer in a week, variation in lab use will be useful as correlations with student development variables are sought.

While the data from Computers Services are helpful in figuring the average times per week that freshmen use microcomputer labs, one question arises, can the mean frequency of use reported by lab users apply to those who do not use the labs? In other words, for freshmen who report using computers more often in settings other than USU computer labs, how likely is it that the frequency with which they use microcomputers is similar to that of freshmen who mostly use the USU computer labs?

Table N-3 compares students who most often use USU computer labs to those who use microcomputers in other settings. The two subgroups of students are compared using reported hours per week using a microcomputer or PC for doing assignments, playing games, and talking to others. The statistical comparison is made using standardized effect size (SES) and probability values (p) for a t test.

In Table N-3 a comparison of the two subgroups shows that mean scores for the use of microcomputers for doing "assignments" and for "talking to family/friends" differ

Table N-3

Comparison of Freshman Who Most Often Use USU Computer Labs to Those Using Computers Elsewhere on Frequency of Using Microcomputers for Assignments, Games, and Communication

	Most often use PCs or microcomputers					
	USU computer labs (n = 252)		Outside USU computer labs (n = 145)		Statistical comparison	
Types of microcomputer use	Mean	SD	Mean	SD	SES	p
Assignments	2.5	1.1	2.4	1.2	0.1	0.20
Games	0.3	0.7	0.8	1.1	-0.6	<.01
Talking to family/friends	1.9	1.1	1.8	1.2	0.1	0.30

only slightly, but that freshmen who mostly use computers outside of the USU computer labs spend more time playing games on microcomputers. In the statistical comparison, the SES demonstrates similarity between subgroups and the magnitude of the difference in use of microcomputers for entertainment (games). Results of the probability tests also shows the statistical similarity of the two subgroups when use of microcomputers for assignments ($p = .2$) and use of microcomputers for telecommunication ($p = .3$) are tested, but when testing use of computers for entertainment there is a statistically significant difference ($p < .01$). However, since in the use of microcomputers for entertainment the mean hours of usage for the subgroup using computer outside of the USU labs exceeds that of the those using the labs, it seems acceptable to use the frequency data from the USU computer labs as a conservative estimate of freshman students' weekly use of microcomputers. Therefore, it is estimated that USU freshman students used a microcomputer on the average about 20 times during a 10-week quarter, or about twice a week.

As an additional method of examining changes in frequency of computer use that occurred during freshmen's first academic year, the lab entry data supplied by USU Computer Services was analyzed. The mean difference between Fall Quarter entries into USU microcomputer labs and Spring Quarter use was -.51. The Pearson correlation coefficient between the two quarters was .54. This indicates a high correlation and supports the finding that the average frequency of freshman microcomputer lab entries was consistent throughout the academic year.

Finally, two daily logs of the entry times were obtained from USU Computer Services the total entries for each hour is presented in Table N-4. Findings in Table N-4 show that the highest rate of use of USU microcomputer labs typically occurred between the hours of 10:00 a.m. and 11:00 a.m.

Table N-4

Hourly Totals of Entries into USU Microcomputer Labs for Two Days

	Total entries per hour	
Hour	April 29, 1997	April 30, 1997
7	20	24
8	49	51
9	71	58
10	92	127
11	85	85
12	75	95
13	63	69
14	82	79
15	58	69
16	44	36
17	51	42
18	33	29
19	36	35
20	34	22
21	28	21
22	15	10

Appendix O

Comparison Between Results Obtained by Pascarella & Terrenzini (1980) and 1996 USU Freshmen During Spring Quarter

The measure developed and tested by Pascarella and Terrenzini (1980) was used in this longitudinal study of freshmen entering USU in fall 1996. a factor analysis of the responses with a varimax rotation revealed similarities between the scale pattern loading for data obtained from USU freshmen and those obtained by Pascarella and Terrenzini. This similarity supports the construct validity of the measure. In Table O-1 items from the questionnaire are grouped according to the factors identified as predictive of social integration (intellectual integration will be reported under research question 6) and the loadings obtained by Pascarella and Terrenzini (1980) are presented for comparison. To ensure that items were maximally related to the social integration construct and to allow for adequate representation of content on each factor, item loadings were reported only if they had a factor loading ≥ 0.40.

Table O-1 shows that item weights obtained in a factor analysis of USU data from the current study are similar to weights obtained by the authors of the instrument, Pascarella and Terrenzini (1980). In addition to having similar item weights, the item loading pattern on factors corresponded closely. That is, the same (3-4) items with the greater weights which grouped together in Pascarella and Terrenzini also grouped together when data for 1996 USU freshmen was analyzed (See appendix K containing the factor loading for all items in the current study).

Table O-1

Loading Pattern of Social Integration Factors Obtained from Pascarella and Terrenzini (1980) Compared to Loading Pattern for Entering USU Freshmen Spring 1997

Factors	Pascarella & Terrenzini (1980)	USU Spring 1997
Peer-Group Interactions		
Develop close personal relationships with other students.	0.82	0.73
Student friendships personally satisfying.	0.82	0.81
Relationships with other students a positive influence on personal growth, values and attitudes.	0.76	0.75
Relationships with other students a positive influence on intellectual growth.	0.72	0.60
It has been difficult to meet and make friends	-0.71	-0.59
Interactions with Faculty		
Nonclassroom interactions with faculty positive influence on personal growth, attitudes and values.	0.86	0.78
Nonclassroom interactions with faculty positive influence on intellectual growth.	0.83	0.72
Nonclassroom interactions with faculty a positive influence on career goals and aspirations.	0.73	0.76
Developed a close friendship with at least one faculty member.	0.72	0.72
I am satisfied with the opportunities to meet and interact informally with faculty members	0.47	0.60
Faculty Concern for Student Development and Teaching		
Few of the faculty members are genuinely interested in students	-0.77	-0.77
Few of the faculty members are generally outstanding or superior teachers.	-0.72	-0.78
Few of the faculty members are willing to spend time outside of class to discuss issues of interest and importance to students.	-0.58	-0.77
Most faculty members are genuinely interested in teaching.	0.54	0.58
Most faculty members are interested in helping students grow in more than just academic areas.	0.56	0.51

Appendix P

ANOVA of Pre-Entry Frequency and Spring Quarter Frequency of Using Microcomputers

Table P-1

ANOVA of Pre-Entry Frequency and Actual Frequency of Using Microcomputers for Assignments, Games, and Talking to Family/Friends

Computer use for	Sum of Sqs Treatment (df)	Sum of Sqs Error (df)	F	Sig.
Assignments	9.37(2)	501.73(394)	3.68	0.03
Playing games	0.42(2)	294.82(394)	0.28	0.76
Talking to friends or family or to make friends	6.65(2)	520.01(394)	2.52	0.08

Although Table 21 indicated no practically significant difference between the three pre-entry, frequency of use subgroups, this one-way ANOVA (see Table P-1) shows a statistically significant difference ($p \leq .01$) between freshman students' use of microcomputers prior to and during their first year attending USU. However, with a large sample size statistical significance is attained with small correlation and, as with all tests of statistical significance, an ANOVA does not demonstrate the magnitude of difference existing between the three pre-entry frequency of use subgroups. Therefore, a post hoc Fisher's LSD test was calculated. Mean difference frequency scores were obtained by subtracting fall 1996 scores from spring 1997 scores. Results of this test show that a statistically significant difference ($p \leq .01$) occurred for one of the nine pairs of mean differences (see Table P-2).

Table P-2

Post Hoc Fisher's LSD Test

Computer knowledge	Subgroup levels*		M Diff	Sig.
Using a computer for assignments	1	2	0.07	0.78
		3	0.37	0.13
Using a computer for assignments	2	1	-0.07	0.78
		3	0.30	0.01
Using a computer for assignments	3	1	-0.37	0.13
		2	-0.30	0.01
Playing computer games	1	2	0.06	0.72
		3	0.12	0.54
Playing computer games	2	1	0.06	0.72
		3	0.05	0.60
Playing computer games	3	1	0.12	0.54
		2	0.05	0.60
Using a computer to talk to friends or family or to make friends	1	2	0.04	0.88
		3	0.29	0.24
Using a computer to talk to friends or family or to make friends	2	1	-0.04	0.88
		3	0.25	0.04
Using a computer to talk to friends or family or to make friends	3	1	-0.29	0.24
		2	-0.25	0.04

* 1=not at all, 2= occasionally, 3= frequently

Appendix Q

Factor Analysis Loading Pattern of Academic Integration Factors Obtained from Authors Compared to Loading Pattern for Entering USU Freshmen Spring 1997

To ensure that items were related to the academic involvement construct and to allow for adequate representation of content on each factor, items were reported if they had factor loading ≥ 0.40:

Table Q-1 shows that most item weights obtained through the factor analysis are similar to weights obtained by the authors of the measurement (Pascarella & Terrenzini, 1980). Item e deserves consideration, Pascarella and Terrenzini asked it in the negative as "I have no idea at all what I want to major in," while in the USU

Table Q-1

Factor Analysis Loading Pattern of Academic Integration Factors Obtained from Authors Compared to Loading Pattern for Entering USU Freshmen Spring 1997

Factors	Pascarella & Terrenzini (1980)	USU Spring 1997
Academic and Intellectual Development		
Satisfied with the extent of intellectual development	0.68	0.69
My academic experience has had positive influence on my intellectual growth and interest in ideas.	0.67	0.77
Satisfied with academic experience at USU	0.64	0.65
Few courses this year have been intellectually stimulating	-0.55	-0.41
Interest in ideas and intellectual matters has increased	0.55	0.69
I am more likely now to attend a cultural event	0.43	0.42
Performed academically as well as anticipated	0.41	0.63
Institutional and Goal Commitments		
It is important for me to graduate from college	0.69	≥.40
It is important for me to graduate from USU	≥.40	0.60
Confident I made the right decision	0.63	0.58
I plan to register at USU next Fall Quarter	0.62	0.71
I have no idea at all what I want to major in.	-0.45	0.45

survey it was presented in the positive voice as, "I have a clear idea about what I intend to major in," therefore, items are similar but have opposite signs.

Appendix R

Comparison Between Institutions

Comparison Between Institutions. Conclusions from the present study are specific to USU, yet the opportunity to compare results with other institutions of higher education may broaden the applicability of the findings. Sets of items in the present study were adapted from Cooperative Institutional Research Program (CIRP: e.g., Astin's 1978 and 1993 measure of involvement). CIRP is administered annually by the Higher Education Research Institute (HERI) at UCLA in cooperation with approximately 500 two- and four-year colleges and universities across the United States. Because USU participated in CIRP just prior to the beginning of Fall Quarter 1996, a comparison of student involvement in certain activities can be made between those self-report data reported in CIRP and self-report data in the present study.

In fall of 1996, freshmen participating in CIRP estimated the time they spent involved in social and academic activities during the past year. Table 54 presents a comparison of responses on four variables measuring social involvement across samples of FTFT freshmen; freshmen in the CIRP national study and USU freshmen in CIRP. It must be pointed out, however, that these samples are not discreet. USU students completing CIRP 1996 are a subgroup of all freshmen in four-year public universities who participated in CIRP 1996 and, in relation to the present study, some freshmen completing CIRP 1996 likely completed the questionnaire administered for the current longitudinal study. While the samples from whom data were obtained may share individuals the data were distinct. The purpose of Table 54 is to compare between data on the experience of USU freshman during their last year of high school and the same data from freshmen nation-wide.

Table R-1

Comparison Between USU Freshmen and Freshmen Nationwide on Involvement in Activities During a Typical Week While Attending High School

		Percent of freshmen (hours per week)				
Groups of freshman experience	n	0	<1-2	3-10	11-20	>20
Talking with teachers outside of class						
CIRP at 4-yr universities--HS experience	42,691	9.4	75.2	14.1	1.0	0.3
CIRP freshmen at USU--HS experience	555	6.8	81.5	10.8	0.9	0.0
Exercising or doing sports						
CIRP freshmen at 4-yr. public universities	42,691	3.7	23.3	40.0	23.0	10.0
CIRP freshmen at USU	556	2.7	29.1	44.6	17.8	5.8
Social activities with friends not studies						
CIRP freshmen at 4-yr. public universities	42,691	0.2	5.3	39.0	34.8	20.7
CIRP freshmen at USU	556	0.4	8.1	50.9	28.6	12.1
Volunteer work						
CIRP freshmen at 4-yr. public universities	42,691	36.9	44.5	15.5	2.0	1.1
CIRP freshmen at USU	551	20.1	62.5	15.1	1.7	0.7
Studying or doing homework						
CIRP Public Universities	42,691	1.9	29.1	52.5	13.7	2.8
CIRP USU Freshmen (n=)	558	2.5	28.4	50.3	15.8	2.5

Comparing the time freshmen were involved in talking with teachers outside of class (the first two rows under each variable in Table 54) reveals the differences between the sample of all freshmen enrolled in four-year public universities and the sample of FTFT USU freshmen who participated in the CIRP 1996. From this comparison, it is observed that USU freshmen generally report allocating their time during their last year in high school in much the same way as freshmen across the nation. There are two areas, however, where the difference is noticeable.

1. In time spent in social activities outside of studies a higher percent of USU freshmen (50.9%) report spending fewer hours per week when contrasted to freshman from other public universities (39.0%).

2. In volunteer work a higher percent of entering USU freshman (62.5%) report spending more hours per week prior to entering the university.

This may indicate that, prior to entering the university, USU freshmen are less involved in social activities not related to studies and more involved in volunteer work.

Appendix S

List of Variables

List of Variables Obtained Prior to Freshman Entry into USU

Gl1a.2 Learn to Perform Better under Pressure

Gl1b.3 Be Involved in Student Activities

Gl1c.4 Improve My Writing Skills

Gl1d.5 Explore Potential Jobs and Careers

Gl1e.6 Learn to Better Express Ideas

Gl1f.7 Improve My Study Skills

Gl1g.8 Obtain a Job Related to My Studies

Gl1h.9 Develop Money Management Skills

Gl1i.10 Find a Lifetime Partner

Gl1j.11 Make Potential Business Contacts

Gl1k.12 Be Involved in Sports

Gl1l.13 Get Advice on My Goals

Gl1m.14 Develop Leadership Skills

Gl1n.15 Be Confident about Graduating

Gl1o.16 Improve Communication with Friends

Gl1p.17 Develop Better Self Understanding

Gl1q.18 Develop Helping Skills

Gl1r.19 Improve Computer Skills

Pe6b.27 I Expect My Relationships with Other Students Will Have a Po

Pe6c.28 I Believe That Most Faculty Members at Usu Are Interested in

Pe6e.29 I Have a Clear Idea about What I Intend to Major in

Pe6f.30 I Expect to Develop a Close Friendship with at Least One Fac

Pe6g.31 I Expect to Develop Close Personal Relationships with Other

Pe6h.32 It Is Important for Me to Graduate from Utah State

Pe6i.33 I Expect My Nonclassroom Interactions with Faculty Members W

Pe6j.34 I Expect to Develop Friendships with Other Students That Wil

Pe6k.35 I Expect That My Nonclassroom Interactions with Faculty Will

Pe6l.36 I Expect My Interpersonal Relationships with Other Students

Pe6m.37 I Expect My Nonclassroom Interactions with Faculty Will Have

Pe6n.38 It Will Be Easy for Me to Meet and Make Friends with Other S

Pe6o.39 It Is Important for Me to Graduate from College

Pe6p.40 Most Faculty Members Are Generally Interested in Teaching

Pe6q.41 I Expect to Feel a Sense of Community and Belonging at Utah

Pe6r.42 I Expect That My Personal Values Will Be Challenged in Colle

Pe6s.43 My Family Is Very Supportive of My Going to College

Spea.44 Studying or Doing Homework by Myself

Speb.45 Using a Computer for Assignments

Spec.46 Working with Friends on Homework

Sped.47 Talking with Teachers Outside of Class

Spee.48 Exercising or Doing Sports

Spef.49 Playing Computer Games

Speg.50 Using a Computer to Talk to Friends/Family or Make Friends

Speh.51 Social Activities with Friends Not Related to Studies

Spei.52 Working for Pay

Spej.53 Volunteer Work

Spek.54 Using a Library

M19.73 Do You or Your Family Own a Microcomputer?

Ca.84 Create/Change a Document

Cb.85 Save a Document to a Disk

Cc.86 Use a Macintosh Operating System

Cd.87 Make a Copy of a File

Ce.88 Use a Word Processor

Cf.89 Access a Directory of Saved Files

Cg.90 Use Mail Merge for Form Letters

Ch.91 Use Clip Art

Ci.92 Teach Yourself a Software Program

Cj.93 Write Formulas in a Spreadsheet

Ck.94 Do Spreadsheet Macros

Cl.95 Create Functions for a Database

Cm.96 Use an Electronic Bulletin Board

Cn.97 Send and Receive E-Mail

Co.98 Change a Program Someone Wrote

Cp.99 Use a Printer to Print a Document

Cq.100 Use Windows

Cr.101 Rename a File

Cs.102 Install New Software to a Hard Drive

Ct.103 Delete a File from a Disk

Cu.104 Produce a Resume

Cv.105 Produce a Newsletter

Cw.106 Enter Data in a Spreadsheet

Cx.107 Create a New Spreadsheet

Cy.108 Create Graphs from Spreadsheet Data

Cz.109 Enter Data in a Database

Caa.110 Sort and Query a Database

Cab.111 Locate and Retrieve Info. Over Internet

Cac.112 Write a Program in Code

Cad.113 Test and Debug a Program

Sa.115 If There Was No One Around to Tell Me What to Do as I Go

Sb.117 If I Had Never Used a Package like it Before

Sc.119 If I Had Only the Software Manual for Reference

Sd.121 If I Had Seen Someone Else Using it Before Trying it Myself

Se.123 If I Could Call Someone for Help If I Got Stuck

Sf.125 If Someone Else Had Helped Me Get Started

Sg.127 If I Had a Lot of Time to Complete the Job

Sh.129 If I Had Just the Built-In Help Facility for Assistance

Si.131 If Someone Showed Me How to Do it First

Sj.133 If I Had Used Similar Packages Before this One

Ia.134 Academic Ability

Ib.135 Creativity

Ic.136 Leadership Ability

Id.137 Mathematical Ability

Ie.138 Computer Ability

If.139 Interpersonal (Social) Ability

Ig.140 Writing Ability

I26.147 Residency Status

I29.152 Ethnic Status

I31.153 Highest Education Level- Mother

I31.154 Highest Education Level- Father

I32.155 Age

I33.156 Gender

Appendix T

Negative and Positive Regression Values of Variables

Social Development

Variables with Negative Weights	
Frequency: Hours per week using a computer for assignments: difference in hours per week	-.156
Frequency: Years of experience using a microcomputer	-.17
Frequency: Total USU microcomputer lab entries for the freshman year 1996-1997	-.148
Frequency: Playing computer games, estimate of hours per week to be spent	.148
Breadth: Spreadsheet skill, ability to enter data in a spreadsheet	-.120
Breadth: Information retrieval skill, ability to send and receive E-mail	-.124
Breadth: Graphics skill, use clip art	-.213
Computer confidence: "If I had only the manual for refererice"	-.191
Computer confidence: "If I had never used a package like it before"	-.20
Computer confidence: "If someone showed me how to do it first"	-.120
Variables with Positive Weights	
Frequency: Hours per week using a computer for assignments, games, and communication	.21
Frequency: Estimate of hours per week using a computer for assignments	.179
Frequency: Hours per week spent playing computer games	.171
Frequency: Playing computer games, estimate of hours per week to be spent	.138
Breadth: Word processing skill, ability to produce a newsletter	.229
Breadth: Database skill, create functions for a database difference between pre and spring	.150
Breadth: Word processing skill, produce a business letter	.13
Breadth: Programming skill, debug a program the difference over year	.12
Breadth: Database skill, create function for a database	.135
Computer confidence: "If I could call someone for help"	.284
Computer confidence: "If I could call someone for help"	.137
Computer confidence: "If I could call someone for help"	.23

Academic Development

Variables with Negative Weights	
Breadth: Number of software packages used during a microcomputer session	-.103
Breadth: Basic skill, copy a file	-.117
Breadth: Basic skill, change in ability to make a copy of a file during year	-.191
Breadth: Basic skill, change in ability to make a copy of a file during year	-.141
Breadth: Basic skill, save a document to a disk	-.151
Breadth: Programming skill, write a program in code	-.124
Breadth: Information retrieval skill, use an electronic bulletin board	-.180
Breadth: Information retrieval skill, use an electronic bulletin board	-.216
Breadth: Information retrieval skill, change in ability to retrieve information over the Internet	-.135
Breadth: Information retrieval skill, change in ability to retrieve information over the Internet	-.227
Breadth: Database skill, change in ability to enter data into an existing database during year	-.151
Frequency: Use of computer for assignments, change in number of hours per week first year	-.140
Frequency: Estimate of hours per week to be spent playing computer games	-.130
Frequency: Hours per week playing computer games	-.156
Variables with Positive Weights	
Breadth: Word processing skill, produce a résumé	.152
Breadth: Word processing skill, produce a résumé	.163
Breadth: Basic skill, save a document to disk	.166
Breadth: Basic skill, use Windows operating system	.140
Breadth: Word processing skill, change in ability to use mail merge for form letters during year	.146
Computer confidence: "If someone had helped me get started" change during 1996-97 year	.141
Computer confidence: "If someone showed me how to do it first"	.142
Computer confidence: "If I had used similar packages before"	.143
Frequency: Microcomputer ownership while at USU	.131
Frequency: Hours per week using a computer to talk to friends and family	.112
Frequency of microcomputer use prior to entering USU	.115
Frequency: Total USU microcomputer lab entries for the year	.186
Frequency of microcomputer use in year prior to entering USU (dichotomized)	.216
Frequency: Computer ownership	.150

Appendix U

Rotated Factor Matrix for Measure of Student Integration

Table U-1

Rotated Factor Matrix Obtained for Entering USU Freshmen Spring 1997 Using Pascarella and Terrenzini's Measure of Student Integration (1980)

Factor		Factor loading
Interactions with Faculty		
k.	Nonclassroom interactions with faculty positive influence on personal growth, attitudes and values.	0.77020
m.	Nonclassroom interactions with faculty a positive influence on career goals and aspirations.	0.76000
f.	Developed a close friendship with at least one faculty member.	0.72297
l.	Nonclassroom interactions with faculty positive influence on intellectual growth.	0.72
cc.	I am satisfied with the opportunities to meet and interact informally with faculty members	0.61994
d.	I have actively sought contacts with my professors	0.56465
e.	I have a clear idea about what I intend to major in	0.44513
c.	Most faculty members at USU are interested in helping students grow in more than just academic areas.	<.35
Peer-Group Interactions		
j.	Student friendships personally satisfying.	0.81413
l.	Relationships with other students a positive influence on personal growth, values and attitudes.	0.75218
g.	Develop close personal relationships with other students.	0.72267
b.	Relationships with other students a positive influence on intellectual growth.	0.60129
n.	It has been difficult to meet and make friends (reverse coded)	0.59616
bb.	Most students at USU have values and attitudes different from my own (reverse coded)	<0.35
Academic and Intellectual Development		
x.	My academic experience has had positive influence on my intellectual growth and interest in ideas.	0.76441
z.	Satisfied with the extent of intellectual development	0.71831
s.	Satisfied with academic experience at USU	0.69229

(table continues)

Factor		Factor loading
w.	I have performed academically as well as I anticipated	0.60396
u.	Interest in ideas and intellectual matters has increased	0.57860
v.	I am more likely to attend a cultural event	0.57860
p.	Most faculty members are genuinely interested in teaching.	<0.35
Faculty concern for student development and teaching		
ee.	Few of the faculty members are willing to spend time outside of class to discuss issues of interest and importance to students. (reverse coded)	0.80760
dd.	Few of the faculty members are generally outstanding or superior teachers. (reverse coded)	0.78250
y.	Few of the faculty members are genuinely interested in students. (reverse coded)	0.77799
aa.	Few of the students I know would be willing to listen to me and help me if I had personal problems. (reverse coded)	0.72105
t.	Few courses this year have been intellectually stimulating (reverse coded)	0.57585
Institutional and Goal Commitments		
h.	It is important for me to graduate from USU	0.76378
ff.	I plan to register at USU next Fall Quarter	0.71480
a.	Confident I made the right decision	0.53688
o.	It is important for me to graduate from college	<0.35

Appendix V

Probabilities, Effect Sizes, and Correlation Coefficients for

Comparison of Pre-Entry Frequency Subgroups

(see Table 21)

Table V-1

Probabilities, Effect Sizes, and Correlation Coefficients for Comparison of Pre-entry Frequency Subgroups

Subgroups	p	Significant ($p \leq .01$)	Effect Size	r
Using a computer for assignments				
Not at all & Occasionally	0.896	Not	0.03	-0.23*
Occasionally & Frequently	0.001	Sig	-0.35	-0.56*
Not at all & Frequently	0.132	Not	-0.32	-0.31*
Playing games on computers				
Not at all & Occasionally	0.752	Not	-0.07	-0.04
Occasionally & Frequently	0.597	Not	-0.06	0.03
Not at all & Frequently	0.569	Not	-0.12	0.03
Using a computer to talk to family and friends or to make new friends				
Not at all & Occasionally	0.854	Not	-0.04	-0.12*
Occasionally & Frequently	0.040	Not	-0.21	0.05
Not at all & Frequently	0.249	Not	-0.25	0.10*

N = 413

* Correlations significant at the .05 level (2-tailed)

VITA

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ADDRESSES

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EDUCATION

Ph.D. Utah State University, Logan, 1999
Major: Business Information Systems and Education
Major Professor: Thomas S. E. Hilton, Ph.D.

Dissertation Title: A Model of Freshman Use of Microcomputers Related to Intellectual and Social Development

M.S. University of Utah, Salt Lake City, 1990
Masters of Public Administration specializing in Human Resource Management and International Development, Center for Public Policy and Administration

B.A. University of Utah, Salt Lake City, 1974
Bachelor of Science in Anthropology specializing in Meso American Cultures

PROFESSIONAL EXPERIENCE

April 1995 - Present	Program Evaluation: Early Intervention Research Institute as Project Coordinator and Research Associate designing and implementing evaluation projects for federal and state grants. Responsibilities include all aspects of social science research and evaluation including conceptualization and design of projects; grant writing, instrument design, managing data collection, design and creation of databases; conducting analyses using SPSS, and report writing for publication.
Sept. 1994 - April 1995	End-user Instruction: USU Computer Lab as Lab Consultant maintaining networked PC systems and assisting students in use of microcomputer applications.
Oct. 1990 - Aug. 1995	Customer Satisfaction Reporting: Satisfaction Development Systems, Inc. as Senior Research Analyst interpreted and reported survey research; Vice-President of Operations managed calling centers, primarily responsible for analysis of data, and producing final reports.

July 1989 - July 1990	Government Internships: Utah State Office of Education. Compiled employees' manual for the department. Conducted new employees' orientation. Governor's Office of Planning and Budget. Database input.
June 1983 - July 1988	Independent Contractor, Real Estate Sales: Salt Lake City, UT

PROFESSIONAL PRESENTATIONS

Goetze, L., Judd, D.R.. & Akers, J.F. (1998, March). Preliminary results of the Part H (0-3) parent fees impact study. Presentation at Utah's Early Intervention and Preschool Conference, Salt Lake City, UT.

Hilton, T., & Judd, D.R. (1996, September). Student computer competency at a western university. Presented at the International Association for Computer Information Systems, Las Vegas, NV.

Innocenti, M.S., Roberts, R.N., Judd, D.R. & Taylor, M.J. (1997, February). Transition from Part H to preschool in Utah: Issues, measures, and implications for others. Presented at Pacific Rim Conference, Honolulu, HA.

Judd, D.R. (1998, November). Replication of a quality process: Comparing stakeholder opinion of microcomputer curriculum. Presentation at Delta Pi Epsilon Research Conference, Louisville, KY.

Judd, D.R. (1997, February). Correlations between entering freshmen's development and use of microcomputers in a university environment. Presented at the Western Business Educators Association 1997 Convention, Billlings, MT.

Roberts, R., Innocenti, M.S., Goetze, L., Judd, D.R., & Taylor, M.J. (1998, March). Holding up the mirror to early intervention. Presentation at Utah's Early Intervention and Preschool Conference, Salt Lake City, UT.

Roberts, R., & Judd, D.R. (1998, May). Measuring parental satisfaction with services to children with disabilities. Presentation at the Conference on Research Innovations in Early Intervention, Charleston, SC.

RESEARCH GRANTS

Judd, D.R. & Hilton, T.E. (1998, October). Comparing Stakeholder Opinion of Microcomputer Curriculum. Submitted to the Delta Pi Epsilon Research Foundation, Inc.

Judd, D.R., Taylor, M. J. & Innocenti, M.S. (1999, February). Finding Utah's most-in-need children: Process improvement for severely disabled and culturally diverse populations. Submitted for Mineral Lease Grants to Utah State University Vice President of Research.

Goetze, L. D., & Judd, D.R. (1997, March). Developing and Implementing Participatory Parent Fee Model Options. Proposal submitted to the U.S. Department of Education.

Goetze, L. D., Judd, D.R. (1997, May). Utah Part H (ages 0 - 3) Parent Fees: An Impact Study (UPPIS). Proposal submitted to the Utah State Department of Health.

Roberts, R. N., Behl, D., Akers, A.L., & Judd, D.R. (1998, March). Monitoring and Measuring Community-Based Integrated Systems of Care. Proposal submitted to Maternal and Child Health Bureau, U.S. Department of Health and Human Services.

Roberts, R.N., Innocenti, M.S., Hahne, K., Akers, J. F., & Judd, D.R. (1998, March). Coming Home to Early Intervention: Families Lead the Way. Proposal submitted to the Office of Special Education and Rehabilitative Services, U.S. Department of Education.

MAJOR RESEARCH PROJECTS

"Evaluation of Indiana's First Steps Early Intervention System," two-year study of a recently implemented family-centered system of care incorporating finances. 10/98-present.

"Utah Part H (ages 0-3) Parent Fees: An Impact Study," year-long study of a newly implemented fee impacting families with young children with disabilities. 7/97-7/98.

"Utah Early Intervention Project," three year longitudinal study of Utah programs serving families with disabled children. 4/95-present.

"Evaluation of Utah State University's College of Education Interdepartmental Doctoral Program." Final report submitted February 1995.

"TIE Systems, Inc. Customer Satisfaction Program," 31 branches in U.S. and Canada for monthly survey of service for repair and installation. 10/91-8/95

"US Intelco Subscriber Satisfaction Audit," administered and created reports for 20 Independent Telephone Companies. 12/91 - 8/95.

"Economic Development and Entrepreneurship Training: Focus on Utah's Disadvantaged Communities." Policy Paper submitted August 1990.

"Entrepreneurship Training in Utah," Utah State Dept. of Community and Economic Development. Final report submitted November 1989.

TEACHING EXPERIENCE

Microcomputer Applications for Business, Fall and Winter Quarters 1995-96, Department of Business Information Systems, Utah State University, Logan, UT.

VOLUNTEER EXPERIENCE

President: Local chapter of Delta Pi Epsilon, the national honorary professional society for business education research, July 1998-present.

President: Utah-Bolivia Partners of the Americas, April 1991-Jan. 1994.

Project Director: Center for Humanitarian Outreach and Intercultural Exchange (CHOICE), Guatemala, 1993-1992, Peru, 1989-1990. Bolivia, 1988-1989.

Vice-Chairman: Andean Children's Foundation, September 1985-February 1989.

LANGUAGE

Spanish: Moderate proficiency in verbal and written communication.
Aymara (indigenous language of Andean region): proficient in basic verbal communication.

PROFESSIONAL ORGANIZATIONS

Delta Pi Epsilon, the national honorary professional society for business education research
American Society for Quality, Sections on Quality Management and the Public Sector
National Business Educators' Association and its local chapter the Utah
Business and Computer Educators' Association

MEMBERSHIP IN PROFESSIONAL SOCIETIES

Society for Research in Child Development
National Association for the Education of Young Children
South Dakota Association for the Education of Young Children
East Central Association for the Education of Young Children
Phi Upsilon Omicron
Children's Prosocial Development and Neutral Sociometric Choice
Parent Education for Children