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Student and Faculty Perceptions of Technology's Usefulness in Community College General Education Courses

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By

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Educational institutions of all levels invest large amounts of time and resources into instructional technology, with the goal of enhancing the educational effectiveness of the learning environment. The decisions made by instructors and institutions regarding the implementation of technology are guided by perceptions of usefulness held by those who are in control. The primary objective of this mixed methods study was to examine the student and faculty perceptions of technology being used in general education courses at a community college. This study builds upon and challenges the assertions of writers such as Prensky (2001a, 2001b) and Tapscott (1998) who claim that a vast difference in technology perception exists between generational groups, resulting in a diminished usefulness of technology in instruction. In this study, data were gathered through student surveys and interviews, and through faculty surveys and interviews. Analysis of the data used Kendall's Tau test for correlation between various student and faculty variables in various groupings, and also typological analysis of the transcribed interview data. The analysis of the quantitative data revealed no relationship between age and perception of technology's usefulness. A positive relationship was found to exist between the perception of the frequency of technology use and the perception of

technology's effectiveness, suggesting that both faculty members and students believed that the more technology is used, the more useful it is in instruction. The analysis of the qualitative data revealed that both faculty and students perceive technology to be useful, and that the most significant barriers to technology's usefulness include faulty hardware and software systems, lack of user support, and lack of training for faculty. The results of the study suggest that the differences in perception of technology between generations that are proposed by Prensky may not exist when comparing adults from the younger generation with adults from the older generation. Further, the study suggests that institutions continue to invest in instructional technology, with a focus on high levels of support and training for faculty, and more universal availability of specific technologies, including web access, in class video, and presentation software.

DEDICATION

This effort is dedicated to my family, who has endured every step of the process with me with support and encouragement.

Constanze, Robert, Gabrielle, Julian, and Samara - You will always be my biggest accomplishments.

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Introduction and Statement of the Problem

Conceptual Underpinnings

Higher education institutions spent almost 7 billion dollars on educational technology in 2006, not including salaries of technology support staff working at those institutions. This number represents a 35% increase from 2005 (Kiernan, 2006), and an even more significant increase from 2000, when 2.7 billion was spent (Cuban, 2003). In 2009, spending for technology across all levels of education was over 63 billion dollars (Brant, 2010). Colleges and universities are making a significant investment in technology with the goal of helping students learn, and the pressure for those institutions to assess the outcomes of these investments is mounting.

Community colleges in the United States can be traced back to the early 1900's, according to Cohen and Brawer (2004). When studying students between the ages of 18 and 24 as a reflection of that age group in the greater population, community colleges are a good venue for a concentrated sample, as Cohen and Brawer report that in 1999, as many as 63% of high school graduates entered some form of postsecondary education. Many of these students found themselves entering community college. The accessibility of these colleges make them an interesting reflection of our society as a whole. As Cohen and Brawer (2004) state, "to an institution that tries to offer something for everyone in the community, everyone is potentially a student" (p. 39). Rama Ramaswami (2009) writes in *Campus Technology* that community colleges are not only leading in enrollment growth, but they are leaders in technology use as well.

Instructors in colleges and universities across the globe are investing significant amounts of time learning to use and integrate various technologies into their teaching practice. However, their decisions to adopt these practices are driven by social or internal factors rather than any data that would indicate how their teaching might be improved from the student perspective (Kelly, 2005). Models such as Rogers' Diffusion of Innovations Theory (Rogers & Rogers, 2003) and the Technology Integration Process Model (Nicolle & Lou, 2008) were developed as a means of explaining how the use of technology spreads through an institution or group of people.

Johnson (2005), Oblinger and Oblinger (2005) , Prensky (2001a, 2001b) and Tapscott (1998) state that there is an inherent mismatch between the way instructors and students use technology, and this mismatch results in a less effective use of technology from students' perspectives. According to these writers, the problem stems from a generational gap between students and their older instructors, which causes the two groups to think about and use technology in different ways. This younger generation is referred to as *Digital Natives* (Prensky, 2001a), the *Net Generation* (Tapscott, 1998), or *Millenials* (Howe & Strauss, 2000, 2003; Oblinger & Oblinger, 2005). These authors claim that this generation has a unique set of attributes. "They are held to be active experiential learners, proficient in multitasking, and dependent on communications technologies for accessing information and for interacting with others" (Bennett, Maton, & Kervin, 2008, p. 776). This difference between teachers and students in their technology use, according to Prensky (2001a), results in student perceptions that technology is less useful than their older-generation instructors perceive it to be. While it seems counterintuitive that a technology-focused generation would find technology less than useful in

the school setting, Prensky attributes this dissatisfaction with school technology to the mismatch between students and their older generation teachers.

There is research that directly contradicts Prensky's (2001a, 2001b) ideas about this generation of Digital Natives. A report released in June of 2009 by the Nielsen marketing research group states that the common idea that young people, who are universally technology savvy use the Internet and other technologies in significant new ways compared to the previous generations, is a myth. These Digital Natives still prefer the TV, uses the Internet in pretty much the same ways as their parents, and actually spends less time playing video games and watching online video than the older generation (Nielsen, 2009). The only area where the Digital Natives were significantly different is in their use of mobile devices and media.

Studies and papers in this subject area place a high importance on the perceptions of both teachers and students when it comes to instructional technology. Teachers' perceptions play an important role in both the decision to adopt a technology and the way it is used in their teaching practice (Chen, 2008; Okojie & Olinzock, 2006; Spotts, 1999). Student perception of the usefulness of instructional technology is widely used in the literature as an indicator of both student intent to use technology and whether the technology has value in the learning environment (Conole et al., 2008; Johnson, 2005; Levin & Hansen, 2008). However, the data are insufficient to support a level of agreement between the perceptions of instructors and their students when it comes to the usefulness of instructional technology. Since the basis of generational theories of technology use is the existence of a mismatch between how student and teachers perceive technology, these data provided an opportunity to test the applicability of these

ideas. These data are also important to the process of selecting and implementing instructional technologies that are seen as useful by students.

Statement of the Problem

It has been suggested by Prensky (2001a, 2001b) and others (Tapscott, 1998; Gee, 2003; Johnson, 2005) that as we move from the current generation of students to the next, the usefulness of our current methods of using technology in education will be diminished. These researchers claim that this diminished usefulness is the result of "the disparity between the technological skills and interests of new students and the limited and unsophisticated technology use by educators" (Bennett, Maton, & Kervin, 2008, p. 777). To maximize technology's usefulness in the community college, we must understand the differences in the way our instructors and our students perceive and relate to the technology we use.

Purpose of the Study

The primary purpose of the study was to examine how community college students' perceptions of the usefulness of instructional technology in their general education courses align with their instructors' perceptions of the same technologies. Prensky (2001a) and Tapscott (1998) maintain that these technology differences are causing students to have negative feelings about technology and school in general (Bennett, Maton, & Kervin, 2008). Bennett, Maton, and Kervin (2008) call for "considered and rigorous investigation that includes the perspectives of young people and their teachers, and genuinely seeks to understand the situation..." (p. 784). This study contributes to such understanding through the perspectives of students and teachers.

Significance of the Study

Community colleges make significant investments into the use of instructional technology, fueled by the belief that these technologies are useful because they help students learn. Instructors who use such technologies may do so with a more specific intent, or with an instructional or pedagogical goal in mind. The significance of this study lies in the investigation of how students perceive the technology that was used in their classes. By comparing it with the perceptions and the instructional goals of their instructors, this study provided an important view into whether their students perceive the use of technology to be as useful.

The results of this study are significant on two different levels: First, the study provided instructors with insight into how students may perceive the usefulness of the instructional technologies that they use in their classes, and how they might make those technologies more useful in helping students learn. Second, the study added to existing research on student perceptions of the usefulness of technology in college classes, both in the context of the technologies used and the context of student characteristics.

Research Questions

Primary Research Question

- How did students' perceptions of instructional technology use compare with their instructors' perceptions of instructional technology use in the same classroom?

Subordinate Research Questions

- Did students of different age groups differ in their perceptions of the usefulness of instructional technology?
- Did students perceive some types of technology to be more useful than others?

Overview of the Study

This study examined community college instructors' perceptions of the instructional technology used in their classes, and how it compared with the perceptions of their students regarding the same technologies. Quantitative and qualitative data were gathered from full-time faculty teaching general education courses at Bakersfield College, a public, two-year community college in Bakersfield, California. The data gathered focused on the technologies they used in their classes, as well as their perception of how useful those technologies were for student learning. The 43 faculty members who responded to the survey were also asked to participate in an interview and to allow one of their classes to be surveyed to gather data on students' perceptions of technology use. A purposeful sample of nine faculty members was selected from the initial 43 survey respondents based on their technology use. A total of 295 student surveys were collected from the nine classes selected by the faculty interview participants. Student participants were also asked if they would be willing to participate in a short interview regarding their use of technology and their perceptions of instructional technology use in their classes. Ninety students indicated a willingness to be interviewed by providing their contact information at the bottom of the survey, although this number was unevenly distributed among the classes due in part to variance in the sizes of the classes that were surveyed. A total of 18 students were chosen from the student volunteers. Data were analyzed using descriptive statistics that gave a picture of technology use and perceived usefulness in both the faculty and student groups. Basic demographic data from students were also used to assess relationships between gender and age with the perception of technology's usefulness. Finally, various relationships were explored between the perceptions of faculty and students regarding the usefulness of technology within

the same classes, as well as across classes in a technology-specific and in the general sense. Interview data were transcribed, and subjected to typological analysis to determine additional patterns of technology use and perceptions of technology, as well as to triangulate and illustrate the quantitative survey data.

Limitations of the Study

This study was limited by faculty members' willingness to participate in the study, for both the survey and interview sections. The voluntary nature of their participation in the study could have resulted in data that were skewed toward faculty who had a more positive perception of technology. Only faculty who were actively teaching a general education course in the Fall Semester of 2009 were asked to participate. Faculty who were on a non-teaching assignment, whose schedule did not include a general education course, or who were not actively teaching during the study, were also excluded. There was no logical connection between faculty who are actively teaching during a given semester and faculty who have a specific perception of technology. The students who participated were limited to those who were enrolled in the community college during the time of data collection and to those who were over 18 years of age and voluntarily participated in the study. Only students who were willing and able to participate in an in-person interview were included in the student interview portion of the study. The voluntary nature of student participation, in both the survey and interview portions of the study, had the same potential to affect the results as the voluntary nature of faculty participation. Because the study was focused on technology use, students who did not like technology or who were less comfortable with technology may have been less likely to participate, resulting in a result that was skewed.

Delimitations of the Study

This study was delimited by the size, distribution, and scope of the participant group. The participants were selected from a single two-year community college in central California, serving approximately 18,000 students from a diverse, but mostly local population. Faculty survey participants were selected on the basis of having full-time status, and delimited to those who teach at least one face to face general education course at Bakersfield College, as defined by the Bakersfield College 2009 Catalog. Faculty members were invited to participate in the interview portion of the study on the basis of their technology use. Faculty who didn't report the use of instructional technology in their classes were not included in the interview portion of the study.

Student participants were invited to participate in the study on the basis of their enrollment in the classes of faculty members who were invited to participate in the interview portion of the study, and whose class was selected by that faculty member. Only face to face classes were used in the study, which may have affected the technology use and technology savvy of student participants. Only students who were over 18 years of age were invited to participate.

Researcher Biases

The researcher is a professor at the community college where the research was conducted. Participants did not include current or past students of the researcher, and it was made clear to participants that their participation or non-participation in the study would not affect their grades or their standing with the institution. Interview data were coded and scored separate from participant demographic information in order to facilitate objectivity in the process.

The researcher's role as a professor within the community college where the study was conducted may also have had an effect on the results and participation of faculty in the survey. The researcher had prior relationships with five of the nine faculty members who participated in the interview portion of the study. While the exact effect of these relationships in unknown, it is possible that the results of the study could have been affected by these relationships. Member checking and reading of the results by members of the panel of experts were used to help ensure objectivity in the interpretation of the qualitative data.

Definition of Key Terms

The following definitions were used in this study:

Community College - A public, two year higher education institution, commonly offering a mix of both traditional academic and vocational education programs.

Computer - An electronic, digital device used for document creation, calculation, entertainment, and communication.

Digital Immigrants - Marc Prensky's term referring to adult generations who were born before the spread of computing technology in society. They did not originate in the era when computer technology was the norm. Thus, they are immigrants (Prensky, 2001a).

Digital Natives - Marc Prensky's term for those who were born in this era of computer technology. Equivalent to the Net Generation (Prensky, 2001a).

General Education - For the purposes of this study, general education was defined as those classes which fulfilled a general education requirement according to the Bakersfield College 2009-2010 catalog.

Information Technology - Technology, especially computer hardware, software, and systems, which is used in the management and communication of information and the creation-storage and manipulation of data.

Instructional Technology - Devices, computers, and software that are used specifically in the instructional context, whether in a classroom, by a student outside the classroom in fulfillment of the classwork, or in a distance education application.

Internet - A global network of interconnected computer systems used for the exchange of information. It allows access to people, information and resources from anywhere in the world, at any time of day and from a variety of devices.

Mobile Technology - Refers to any technology or computer that is portable. This could include cellular phones as well as portable computers.

Net Generation - A term most widely used by Don Tapscott (1998), referring to the generation that has grown up in a world where computers and the Internet have always existed.

Social Networking - A web site or service that is devoted to helping users develop social connections around shared media, interests, or experiences. Examples include Myspace.com, Facebook.com, and Twitter.com.

Software - A stored set of instructions, written in a specific computer programming language and designed to run on computer hardware. Software is a required component of computer use, and is the primary shaping force of the user experience.

Technology - A broad term that includes computers, cellular phones, video games, and other electronic devices, as well as specific software or programs for those devices.

Twitch Speed - A term frequently used by Prensky (2001a), based on the reaction time required to participate in video games, used to refer to the speed at which the Net Generation prefers to interact with information.

Usefulness - A measure of how helpful to learning the instructional technology in this study is believed to be, either by instructors or students.

Video Games - Games which are played on a computer or other electronic digital device.

Weblog or Blog - A web page that functions as an online journal where the owner contributes information, opinions, or reviews of other web sites on a regular basis.

World Wide Web - A world-wide, interconnected body of web pages hosted on the internet and accessed by computer.

Chapter Two

Review of the Literature

Introduction

This study examined the relevance and applicability of generation-based theories of how students perceive the usefulness of technology, including those of Prensky (2001a, 2001b), Tapscott (1998) and others (Howe & Strauss, 2000, 2003; Oblinger & Oblinger, 2005). While these authors present theories that differ in minor ways in understanding student perceptions of instructional technology, they agree in the importance of generational differences. Each of the aforementioned theories emphasized the differences in perceptions between students from a younger generation and faculty from an older generation as a critical to understanding the success or failure of technology in educational environments. Specifically, they all contend that younger generations of students find technology to be less useful when it is presented to them by their older generation teachers, because the two generations relate to and use technology in different ways.

This review of the literature presents an examination of how technology is used in higher education, as well as relevant research on students and technology use in general. The theoretical framework of the generation that Prensky (2001a) refers to as Digital Natives is also examined in great detail and connected with other authors who posed similar or overlapping theories. Prensky's work in this area was chosen as a framework because it is the most conceptually comprehensive, and was therefore the most useful theory for providing a basis for organizing thought in this area. Further, Prensky's ideas often utilized children to represent

Digital Natives, and contrasted them with their adult teachers (Prensky, 2001a). Now that a significant number of students belonging to the Digital Natives group have entered higher education, the opportunity exists to compare Digital Natives as adults with their adult instructors. This review of the literature concludes with an examination of studies in the area of student perceptions of technology in higher education, some of which have been conducted recently enough to include Digital Native participants, although they are not identified as such.

Technology in Higher Education

Technology is a major focus for funding and effort in higher education. This attention is driven by the popular perception that the investment of time and financial resources in technology will result in a more effective learning environment (Cuban, 2003), as well as outside pressure to keep up with the technology requirements of a changing workplace and a global information-driven economy (Friedman, 2005; Pink, 2006). Institutions have risen to meet this challenge by integrating technology into the curriculum and creating a connected learning environment, and for the most part, students like and appreciate the appearance of technology in their learning environment. However, there are many reports that claimed that the ways technology is being used on these campuses does not represent a change in teaching style, and thus it did not meet the needs of today's learner (Prensky, 2001a; Miller, Pope & Steinman, 2005).

Technology in higher education is a multi-billion dollar industry. Estimates put the amount of money spent on technology to help students learn more effectively at 7% of the average community college's budget (Goldstein & Caruso, 2004). Clearly, technology has been given an important role in our institutional culture, as well as in the spectrum of professional

development activities engaged in by faculty. Technology use in higher education has become very common, and students walk into the classroom expecting their instructors to be technologically-proficient, if not technologically-savvy (Prensky, 2001a; Kvavik & Caruso, 2005; Miller, Pope & Steinman, 2005). The pressure to infuse learning environments with technology isn't being driven solely by students. There are many corporations who have a high stakes interest in technology use in education, and even government entities are pushing for increased technology use in schools. In 2002, the Partnership for 21st Century Skills was formed by a group including the U.S. Department of Education and several large technology corporations such as Dell Computing, Microsoft, Apple Computer and others. Their mission was to ensure that students are able to compete in a global marketplace that is driven and connected by technology (Friedman, 2005; Pink, 2006). While the Partnership for 21st Century Skills was primarily focused on K-12 education, it represented a larger mindset that exists in all levels of education: students need to learn in a technologically-rich environment in order to be successful in a world beyond the walls of our institutions (Roschelle, Pea & Hoadley, 2001).

Institutions have responded to these expectations with enthusiasm, in the form of money and training, with the hope that the learning of students will benefit. No technology seems to be off limits, with institutions using the Internet in various forms, including web sites, online assignments and discussions, instant messaging and blogs (Conole et al., 2008 ; Morrison-Shetlar & Sanders, 2001). Classrooms have been equipped with wireless networks, desktop and laptop computers, and even handheld mobile devices (Borquez, 2004). The list of institutions that share their once closely-guarded lectures via audio podcasts via the Internet has grown into the

hundreds, with the likes of MIT, Harvard, Princeton, and Stanford getting involved in significant ways (Coleman, 2006).

In general, technology seems to be appreciated, and even accepted by students — particularly when it is "embedded in a larger curriculum reform movement" (Roschelle, et al, 2001, p.294) or when it is well integrated with the learning environment (Kerr, 2005). Indeed, studies show that there is a positive relationship between a technology-rich environment and academic achievement, especially when students have the requisite skills to take advantage of the technology (Baker, 2007).

Students and Technology

Students, overall, seem to have very positive attitudes about the technology that is used in higher education. Alghazo (2006) found that student attitudes toward technology in a web-based course were generally good. In this study, students identified several advantages to the technology used, from ease of use to a perceived increase in their understanding of the course material. They also identified a few disadvantages of the technology, although it should be noted that the disadvantages all focused on instances where the technology malfunctioned rather than a lack of utility in the technology or problems with the pedagogical approach (Alghazo, 2006). A study done in 2001 by Sanders and Morrison-Shetlar found that students not only have generally positive attitudes about technology in the learning environment, but their perceptions of technology by students was not dependent on age, race or ethnicity, year in school, or even computer experience. The one factor that showed a relationship with feelings about technology use was gender, as the study found a small gender-based effect on the perception of technology where female students reported a more positive perception of technology. It should be noted,

however, that this could be due to the fact that 65% of the participants in the study were female (Sanders & Morrison-Shetlar, 2001). This research contradicts authors such as Prensky and Tapscott, who stated that differences exist between generations of students, e.g., age differences.

In 2000, a research report on information technology use and cognitive outcomes in the first year of college stated that technology had the ability to fundamentally alter teaching and learning in American higher education (Flowers, Pascarella, & Pearson, 2000). In the decade that has passed since the work of Flowers and colleagues, many researchers in the field of instructional technology contended that although students seem to generally like technology and the fact that we have spent billions of dollars bringing technology into our learning environments, changes to the way we teach have been minimal (Johnson, 2005; Prensky, 2001b). While students seem to be pleased with the increased use of technology in higher education so far, there are also indicators that they want more from us in terms of how technology is used and how it affects our teaching strategy (Kolikant, 2009).

The Net Generation and Digital Natives

The generation of people born between 1980 and 2001 is commonly referred to as the Net Generation (Tapscott, 1998), Digital Natives (Prensky, 2001a, 2001b), or the Millennial Generation (Howe & Strauss, 2000). These labels all have one thing in common: they form an association between people and technology. The unique defining factor of this generation, according to Prensky (2001a), is that they have grown up in a world where personal computers have always existed, and the Internet has been around for as long as they can remember. The members of this generation are now entering college, and according to many writers they bring with them a set of learning preferences and ways of using technology that will leave them

dissatisfied with the use of technology in the learning environment (Howe & Strauss, 2000; Johnson, 2005; Prensky, 2001a, 2001b, 2005, 2006b; Tapscott, 1998).

By looking at the characteristics of the Net Generation and developing a picture of how they relate to technology, it is possible develop a foundation for understanding the differences in how instructional technology may be perceived by students who are part of this group, students who are outside of this group, and the instructors who are putting the technology in place. This serves as a basis for comparison with the data reported by this study.

Prensky (2001a) stated that the culture of the Net Generation is unique, at least in part because of the technology that is available today . It is suggested by some that there are differences in the individuals of this generation as well. For example, Johnson (2006) cited the increasing complexity of today's popular media in changing how the Net Generation thinks. Prensky (2001b) echoed this, claiming that the effects on thinking may be magnified for those born into a culture where these technological tools have always existed, because of a greater neuroplasticity (2001b). Masuda and Nisbett (2003), in the proceedings of the National Academy of Sciences, stated that culture affects thinking patterns, and the way we relate to the world around us. These differences in thinking, according to Green and Bigum (1993), are what lead some older generation educators to feel like they are dealing with "aliens in the classroom" (Green & Bigum, 1993, p119). These differences also may lead to students' perceptions of technology's usefulness being different than the instructors who are implementing the technology in those classrooms (Prensky, 2005).

Mark Prensky (2001a, 2001b, 2005, 2006, 2006a, 2006b) has written and presented extensively on the topic of these generational differences. His paper, "Digital Natives, Digital

Immigrants" (2001a), highlights 10 differences between the Net Generation and previous generations. Presnky's ideas made a useful framework for exploring possible differences between generational groups when it comes to technology in education, as many of the generational attributes found in his description of Digital Natives are reflected in other works on the subject. Prensky (2001a) communicated these generational attributes using a series of comparisons:

Twitch speed vs. conventional speed. This comparison highlights the Net Generation's preference for immediacy and rapid response. According to Frand (2000), this desire for quick interaction is accompanied by a desire for simple and direct access to information.

Parallel processing vs. serial processing. Multitasking is one of the more commonly discussed traits of the Net Generation, both in and out of the academic literature (Baron, 2000; Frand, 2000; Prensky, 2005). Brown told the story of a student who, during the course of a research interview, was continually looking up information on a tiny screen embedded in his eyeglasses (Brown, 2000). While not every member of the Net Generation is walking around with this sort of hardware and access to data, it is not uncommon for this generation to leverage technology to suit their preference for multitasking behaviors. Even when using a computer, they are likely to have music playing, instant messages littering their screen, and two or three other programs running at the same time. Today's software is engineered to support this sort of use (Johnson, 2006; Prensky, 2001a). Multitasking appears to be strongly related to both the Net Generation's desire for immediate access to information and their seemingly random pattern of interacting with data (Prensky, 2001a).

Random access vs. linear thinking. Finding its roots in another technology, the non-linear structure of the World Wide Web, this comparison referred to the non-linear approach used by the Net Generation to explore and interact with knowledge and data (Prensky, 2001b).

Graphics first vs. text first. This is the concept that this generation prefers graphical literacy to textual literacy. Images are used throughout society to communicate in a more immediate way and to a broader audience than text alone is able. The use of images to communicate, especially in technology and the accompanying user interfaces, continues to increase. Graphical literacy is an important skill for learning and thriving in today's world, and younger generations exhibit an increased preference for such communication (Brown, 2000; Prensky, 2001a, 2005).

Connected vs. stand alone. Prensky highlights the Net Generation's desire to be connected to others, something that is facilitated by technology. Junco and Mastrodicasa (2007) found that 76% of college students that they surveyed used instant messaging to communicate. Unlike email or online discussion forums, instant messaging is synchronous. In other words, communication between two people occurs in real time, with both people exchanging messages simultaneously (Jukes, 2006). As previously mentioned, 15% are connected via instant messaging 24 hours a day, seven days a week (Junco & Mastrodicasa, 2007). Frand (2000) writes that "being in touch with friends and family at any time and from any place - is of utmost importance" (p. 15).

Active vs. passive. Prensky (2001a) and others highlight the Net Generation's preference for an active role in their own learning. Brown (2000) writes in his article "Growing Up Digital" that this generation prefers to learn through experimentation and discovery rather than being told,

and stated that technology facilitates this mode of learning. Frand (2000) characterized this difference as a preference for "doing" over "knowing" in a learning context.

Play vs. work. Although Prensky (2001a, 2005) presented this concept with "play" and "work" juxtaposed, further reading indicates that this generation may instead combine the two areas of function. Those in older generations, or Digital Immigrants as they were labeled by Prensky, often assume that the playful relationships that members of the Net Generation share with technology negates their ability to accomplish serious things. The research seems to contradict this assumption; instead of pointless play, this generation seems to be engaging in play with a purpose and are in fact accustomed to both learning and productive work in this modality (Johnson, 2006; Gee, 2003).

Payoff vs. patience. This desire for access to information is accompanied by a preference for immediate feedback. Gee (2003) suggested that this is a prevalent feature of video games, a technology frequently used by the Net Generation, that parallels the learning preferences of this generation. Ian Jukes, a contemporary writer on the topic of education and technology, refers to this generation as the *Instant Message Generation* (McLester, 2005).

Fantasy vs. reality. As much as today's generations expect information and technology to be personal and customizable (Johnson, 2006), they also seemed to understand that technology gives others the same ability to shape reality. Frand stated that the Net Generation doesn't bother distinguishing between "real" and "fake", because they have grown up in a world where things that seem real can be easily fabricated using technology (2000). Prensky (2001a) echoes this idea, stating that students have no trouble accepting fantasy and play elements as part of serious work. Students in the Net Generation seem to be more focused on what is useful and what

makes sense from their vantage point in terms of constructing their own knowledge about the world.

Technology as Friend vs. Technology as Foe. Members of this generation would classify technology as their ally, not an obstacle that they need to overcome (Prensky, 2001a). The Internet and other commonly used technologies have become a digital canvas for the Net Generation. In fact, a 2005 survey of school-age teens found that 57% of teen Internet users create content, and 19% of teen Internet users repurpose and remix existing Internet content to create new content of their own (Lenhart & Madden, 2005). These figures spoke to this generation's tendency to use technology to reshape their learning environment to suit their own preferences and goals whenever possible (Tagliamonte, 1999).

The degree of alignment between Prensky and other writers is significant enough to merit further investigation of these ideas. Additionally, there are some reported cases where the mismatch between Net Generation students and their environment was so great that they were using technology to accomplish learning tasks outside the confines of the regular classrooms. This behavior was seen as a practical use of the technology that was available to students. They were simply learning the material in most efficient way possible, according to their own skills and knowledge (Carlson, 2005).

There are reports that suggest that the profile of the Net Generation student may be overstated in the context of education and what is actually useful. For example, a marketing study released in 2009 by the Nielsen group on technology use by adolescents' stated that teens have a much more surface-level understanding of technology than is claimed by proponents of the Net Generation as a unique generation. The Nielsen report also revealed data that indicate a

high level of reliance on traditional media, such as television, and a use of new media that aligns very closely with older generations. A study by Kennedy, et al. (2006), conducted in the context of Australian Higher Education argued that first year college students (who would be members of the Net Generation) are far less computer literate than previously suggested, and that broad generalizations regarding the sophistication of technology use by younger students tended to overlook the levels of use by older students and instructors as well. In other words, in the scope of everyone involved in higher education, the Net Generation may not be as unique in their technology use as some claim. Studies by Alghazo (2006) as well as Morrison-Shetlar and Sanders (2001) report positive feedback from students on the usefulness of technology in the learning environment, despite their membership in the Net Generation. While the existing writing and research in the area does not all agree on the significance of generational differences in educational technology use, there are enough data to support further investigation of this generation as a group of technology users and learners.

Students' Perceptions of Technology

Beyond the research dealing specifically with the Net Generation, there were several studies looking at technology use and student perceptions of technology in the more general sense. These studies were foundational to this study, as they provided data that reveal both positive and negative perceptions of technology use by students. These studies also revealed links between student perception and technology use, as well as student perception of the usefulness of technology and the effectiveness of technology in improving education. This study examined student perception of technology's usefulness, so therefore it is important to establish

student perception of technology's usefulness as a valid construct to study, in that student perception is linked to the real value of technology in education.

The Technology Acceptance Model (TAM) (Levin & Hansen, 2008) is a theoretical model that is often applied to the use of technology by both students and instructors. The TAM is a "'special case' of the theory of reasoned action" found in Fishbein's 1975 work, cited in Levin and Hansen (2008, p. 666). In other words, the TAM is a theoretical model that provides a framework for understanding the use of new technologies. The primary determining factors in technology use, according to this model, are *perceived usefulness* and *perceived ease of use* (Bagozzi, 1992; Davis & Warshaw, 1992). This model makes an explicit connection between users' perception of technology's usefulness and the actual use of the technology. Studies in the higher education environment validate this construct by comparing perceptions of usefulness to actual technology use (Levin & Hansen, 2008; Liu, Maddux & Johnson, 2004). Levin and Hansen (2008) incorporated the measurement of learning outcomes in conjunction with the Technology Acceptance Model to demonstrate a secondary link between perception of technology and the successful completion of learning outcomes in courses using technology (Levin & Hansen, 2008). The study by Levin and Hansen asked students to rate their perceptions of the usefulness of technology using a survey instrument containing 5-point Likert scales. These scores were analyzed in the context of student achievement of learning outcomes to determine if there was a relationship between student perception of technology and student success. Their conclusion stated that students' perception of technology did have an effect on their success using that technology, but that the degree of success obtained was mediated by the form of the technology. Alternately stated, technologies that were perceived to be useful were

indeed useful to the students in this study, and some technologies were found to be more useful than others. In an indirectly related study, Selim (2003) found that as much as 83% of course web site usage could be accounted for by students' perception of the technology's usefulness.

The aforementioned studies validate students' perception of technology's usefulness as an indicator of students' use of technology, and also prompt further exploration of the link between technology use and successful learning outcome completion. Additionally, other sources highlighted the need for study in this area. Li (2007) argued that listening to the voices of students on the topic of the usefulness of technology is an important component to serving their needs in the learning environment. Although Li (2007) found that students were aware that technology at times required an extra learning curve, and even took more time to accomplish some tasks, they believed that technology was useful for their learning and helped them to accomplish more than they would have without it. Baker (2007) studied students at 16 community colleges, and found that many students preferred the use of of technology in their courses, but also that age and technology preference were negatively correlated. In this study, Baker found that older students preferred less technology in their classes. His findings demonstrate support for technology use among students in general, but also support for the idea that Net Generation students have a higher preference for technology. Baker's study was based on the work of Kvavik and Caruso (2005), who also found that the majority of students in the colleges they studied preferred a moderate amount of technology use in their learning environment. In the Kvavik and Caruso (2005) study, students reported more engagement and a better understanding of the subject matter when technology was used. D'Angelo and Woosley (2007) surveyed students enrolled in Criminal Justice courses at a Midwestern University, and

found that students believed that teaching methods that included Powerpoint and video technologies were effective in increasing their learning. In another study of 922 graduate and undergraduate students, it was found that students perceived technology use in the classroom as useful for their learning and career preparation (Lowerison, et al., 2006). Studies such as these suggest that students generally find technology to be useful in their learning environments.

Although they are less frequent, there are also studies that indicate a negative perspective of technology's usefulness among students. Ng and Gunstone (2002), who found that students' negative perceptions of technology included a belief that it took more time to learn, more assistance was needed when learning with technology, and that technical glitches made technology less effective as a learning tool. D'Sousa and Wood (2004) reported a general mistrust of technology by students in mathematics classes, stating that students in their study preferred traditional pencil and paper methods over using computer software designed for learning.

Students live in a technology-rich environment. Even in cases where there is no computer in the home, students are exposed to a barrage of technological innovations on TV, in stores, and out in the general public. In low income areas, the proliferation of cheap mobile devices allows people instant access to a large social group, despite geographical proximity. Dede (2005) of Harvard University wrote that the students have different ways of learning, due to the addition of digital resources to the regular world through mobile devices. Conoly (2008) wrote that instructors need to consider how students use technology outside of the school setting in order to have the biggest impact in the classroom.

Students overall seem to be technology users, with a slight increase in that use in younger students. What's more, they seem to favor a technology-rich learning environment when it is available, especially when the pedagogy makes effective use of the tools. Their perception of the usefulness of technology in their learning environment appeared to be connected with the effectiveness of the technology in helping them learn, which reinforces the need to study these perceptions (Levin & Hansen, 2008; Liu, Maddux & Johnson, 2004; Selim, 2003).

Instructors and Technology

Many instructors in higher education are making a sincere effort to infuse their teaching with technology with the goal of becoming more effective teachers. Nicolle and Lou (2008) wrote that many faculty members believe that there is a benefit to using some level of technology in their teaching, even in instances when they have not yet incorporated technology into their classes. Textbook publishers have responded to this widespread belief by releasing their texts and many auxiliary materials in digital formats to add value to their print offerings. Faculty perceptions also have an effect on the educational environment, in that they play a role in determining how and what technology is used (D'Angelo, 2007).

Chen's (2008) study examined how teachers' beliefs, both expressed and implicit, have a strong connection to how they integrate technology into their teaching. In his examination of the beliefs and practices of 12 Taiwanese high school teachers, Chen (2008) found that while teachers expressed a belief that technology in the classroom is beneficial, their use was limited by other factors, including conflicting beliefs, improper theoretical understanding, and the influence of other factors. Levin and Hansen (2008), Spotts (1999), and Li (2007) emphasized how teacher's perceptions of technology's usefulness have a positive correlation with their

decision to use technology in their teaching. Surry and Land's (2000) work in this area revealed a connection between helping faculty develop a vision for technology use and the actual implementation of technology in the classroom. Okojie and Olinzock (2006) described teacher perceptions of technology as establishing a set of personal conditions, such as spontaneity and readiness that are necessary for technology integration. Zhao and Cziko's work (2001) presented a similar concept to Okojlie, although in a more formal manner, within a framework called Perceptual Control Theory (PCT). PCT is a model that establishes a set of internal factors which serve as preconditions to technology use (Powers, 1988):

1. The belief that teaching can be improved using technology.

2. The belief that other aspects of teaching will not suffer as a result of the use of technology.

3. The belief that their ability to use the technology will allow them to be successful.

Internal factors can also serve as barriers to technology use by faculty (Churchill, 2006). Faculty still have many fears related to technology. This includes the fear that they will be replaced by technology, and that technology will create a barrier between them and their students that will make them less effective (D'Angelo, 2007). At other times, it is the teachers' beliefs about teaching and learning that can render technology less effective (Heiens, 2006). This concept is also prevalent in much of the literature focusing on the Net Generation (Prensky, 2001a; Tapscott, 1999).

Barriers to technology use can also come from outside the individual. For example, the employment status of the faculty member seems to have a significant effect, with part-time faculty using technology in their classes significantly less than their full-time counterparts

(Jackowski, 2005). This could be a secondary effect of another factor, however. Specifically, it could be a matter of access to professional development classes, which have been shown to have a significant positive effect on the use of technology. The availability of technology support services also played a role in faculty technology use (Kelly, 2005). In this doctoral dissertation, Kelly surveyed faculty members at a liberal arts college. The study found that faculty participants desired higher levels of technology use in their classes, but that lack of training and a perceived lack of organizational support were significant barriers to its implementation.

There are clearly a large number of factors that are involved in the decision to use technology in the classroom, both internal and external. Faculty have beliefs and experiences that can help or hinder them in this process, and their perception of technology's value comes into play in deciding whether the potential benefits of technology are worth the work and the risks that come into play. These internal factors are mitigated by external forces, including the amount of support and training available, as well as the amount of time that faculty have to devote to technology use (Johnson, 2003). It is important to learn more about faculty needs and perceptions when it comes to technology use, because they are ultimately the ones who are responsible for deciding how and whether technology should be used in the educational environment. Their perceptions matter because these perceptions become the reality that their students experience in the classroom, and if students cannot relate to this reality it may not bear fruit in their learning (Prensky, 2001a).

Summary

The research in the area of instructional technology makes several things clear: First, technology plays a major role in higher education today, and that role is likely to continue to

grow. Technology commands a huge amount of financial resources, as well as significant portions of our faculty members' time and personal resources. Second, there is enough research available to suggest that something is occurring in terms of how our students use and relate to technology. Some, like Prensky (2001a, 2001b) and Tapscott (1998), suggest that this relationship between students and technology is being driven by those who belong to the Net Generation, or Digital Natives. Others discount the significance of the effect that generational differences have on the learning environment, choosing instead to emphasize the ways that students as a whole are changing. These researchers emphasize variables such as exposure to technology, income level, and access to technology over age, which is often the primary consideration of the generation-focused research. Third, the perception of technology's effectiveness is an important consideration when examining technology use by both faculty and students. Perception of effectiveness has been shown to be connected with the decision to use technology, how often it is used, and even how it is used.

The research presented above suggests that there is value in studying how teachers and students perceive technology, and specifically how their perceptions of effectiveness vary with regard to the same technology used in real learning situations.

Chapter Three

Methodology

Purpose of the Study

The primary purpose of the study was to examine how community college students' perceptions of the usefulness of instructional technology in their general education courses align with their instructors' perceptions of the same technologies. The secondary purpose of this study was to examine any relationships which may exist between demographic factors, such as age and gender, and students' perceptions of technology effectiveness in their college classes.

Significance of the Study

Community colleges, and the instructors who teach in them, make significant investments of time and money in the use of instructional technology, fueled by the belief that these technologies are useful in helping students learn. Instructors who use such technologies may do so with a more specific intent, or with an instructional or pedagogical goal in mind. The significance of this study lies in the investigation of how students perceive the technology that is used in their classes. By comparing it with the perceptions and the instructional goals of their instructors, this study provided an important view into whether students perceive the use of technology to be as useful.

The results of this study may be significant on two different levels. First, the study provided instructors with insight into how students may perceive the usefulness of the instructional technologies that they use in their classes, and how they might make those technologies more useful in helping students learn. Second, the study added to existing research

on student perceptions of the usefulness of technology in college classes, both in the context of the technologies used and the context of student characteristics.

Research Questions

Primary Research Question

How did students' perceptions of instructional technology use compare with their instructors' perceptions of instructional technology use in the same classroom?

Subordinate Research Questions

Did students of different age groups differ in their perceptions of the usefulness of instructional technology?

Did students perceive different types of technology to be more useful than others?

Panel of Experts

The survey instruments and interview guides in the appendices were reviewed and refined by a panel of experts. This panel was taken from within the Kern Community College District, which is the college district represented in the study, and from experts in the field of Educational Technology. The panel consisted of Dr. Paul Sparks and Dr. Margaret Riel of Pepperdine University's Graduate School of Education and Psychology, Debby Kilburn of the Kern Community College District, Julia Fallon of the Washington State Department of Educational Technology, and Pamela Rivers, graduate of Pepperdine University's Masters in Educational Technology Program and faculty member at the University of Phoenix. The interview guide and research questions for the study were shared with each member of the panel. The panel of experts were asked to review the interview questions, and to suggest additions and changes that would make the interview more effective, easier for participants to understand, or better address

the research questions for the study. Their recommendations were implemented in the survey instruments and the interview guides prior to the pilot study.

The panel suggested that the student survey instrument include both a standard set of technologies and space to include specific technologies that were used by the faculty member, but not on the standard list. The actual technologies that were included as standard technologies in the student surveys were edited as a result of feedback from the panel of experts. Members of the panel also offered suggestions on wording of questions and other text in the instrument to increase clarity for the participants.

Pilot Study

Upon approval of the proposal, the survey instruments and the interview guides were pilot tested with faculty and students from Bakersfield College. The survey was administered to four general education faculty members, and those same faculty members were interviewed using the faculty interview protocol. In addition to responding to the survey and interview questions, the faculty members were asked to provide their feedback on the items, including those that may have been difficult to understand, or that they felt were not relevant. A similar process was undertaken with a group of 23 students, using the actual data from one of the pilot faculty surveys and interviews to shape the more open ended parts of the student survey and interview guide.

The data from the pilot study were confidential and excluded from the data reported in the rest of the study. The feedback and researcher observations on the survey instruments and interview guides were used to further refine and clarify the instruments of the study prior to the commencement of the full study. Specific refinements included minor wording changes in

questions, as well as minor changes to the visual layout of the survey instruments. No substantive changes were made to the content or intent of the questions in the survey instruments or the interview guides.

Research Design and Participant Selection

In order to address the research questions in this study, the Triangulation Design methodology outlined in Creswell and Clark (2007) was used as a basis for the design of this study. This mixed methods design allows the researcher to "directly compare and contrast quantitative statistical results with qualitative findings or to validate or expand quantitative results with qualitative data" (p. 62). In this design, both qualitative and quantitative data are gathered, and are used to provide additional insight to each other. In this study, the use of both types of data provided for a deeper, more meaningful analysis of the results. This conceptual linking of qualitative and quantitative data is supported by Johnson and Onwuegbuzie (2004), who stated that the use of both qualitative and quantitative data allows each method to "overcome the weaknesses in another method" (p. 21).

This study used both surveys and interviews to triangulate data and to provide both depth and breadth in the study, resulting in a more complete picture of how technology is perceived by both faculty and students in general education courses in a community college. The interaction between survey data and interview subject selection is such that each round of survey data collection guided the selection of participants in the next round of interviews. The guiding factors for participant selection in the interviews is mentioned in the context of each cycle of data collection below. The study was completed using a cyclical model, where each cycle provided data and direction for the following cycle, both in terms of the selection of participants and the

specific data items that are collected. Therefore, the research design and participant selection are presented together, by the cycle of the study in which they occurred.

Cycle one participant selection. The procedures used to identify participants were specific to each cycle of the study. In the first cycle, faculty members were invited to participate in the study based on the following two criteria:

1. They were a full-time faculty member at Bakersfield College during the Fall semester of 2009.
2. They were teaching at least one general education course according to the 2009-2010 Bakersfield College Catalog, excluding courses which are not taught in a classroom setting such as physical education. These courses fulfill at least one of the general education requirements according to the Bakersfield College 2009-2010 college catalog.

Faculty who met the above criteria for eligibility according to the official Fall 2009 Class Schedule, a list of full-time faculty, and the 2009 College Catalog were invited via email to participate in the cycle one survey. The total number of faculty who met these criteria was 108, which represented 38% of 283 full-time faculty. Participation in the study was voluntary, so the actual return on the survey was less than the total number of faculty who were identified. The number of faculty who responded to the survey was 43, or 40% of the 108 who were invited.

Cycle one research design. Eligible faculty were emailed with information about the study and an invitation to participate in an online survey. The email contained a clickable hyperlink that respondents could use to go directly to the survey. Both the description of the

study and the survey itself can be found in Appendix A. The mechanics of the survey tool as it was used online are described in the following paragraph.

To reduce error and inconsistency in the survey responses, the survey was divided into sections, where each subsequent section utilized responses from the previous section to generate more data about the same set of technologies used. For example, in the first section, the faculty respondent was asked to list their five most frequently used technologies, and select from a response scale that indicated their frequency of use, with *Often* at one end of the scale and *Not Often* at the other end. When the respondent clicked the button at the bottom of the page to go on to the next page, the technologies that were entered on the first page automatically appeared on the next page. On the second page, the respondent was asked to indicate on a scale of *Very Useful* to *Slightly Useful* how useful they believed each technology to be in helping students learn. At the bottom of this page, the respondent clicked another button to continue on the third page of the survey. On the third page, the same technologies appeared as choices on three questions asking the instructors to identify their goals for using technology in their classes.

The survey was designed to provide an easy interface for faculty to enter their perceptions, while reducing the amount of manual data entry and reinforcing consistency among the technologies mentioned in the survey. This allowed the same technologies to be used, as they were named in the beginning of the survey by the faculty member, throughout the rest of the survey. For example, if the faculty respondent entered “Powerpoint” in the first section, then the same text would appear in subsequent sections of the survey where the faculty would be prompted to enter additional information about “Powerpoint” and how they use it in their classes.

These usability enhancements contained in the Internet-based survey instrument did not change the content or the order of the questions in the survey. Therefore, if the survey had been taken in paper form, the differences in the response set would have been the same, except for the possibility of variance where faculty would have had to answer subsequent questions regarding the same technology.

Cycle two participant selection. The data from cycle one were subject to primary analysis with the goal of selecting approximately 10 faculty members who represented a higher frequency and greater depth of technology use to participate in cycle two of the study. The rationale for choosing faculty who indicated a higher level of technology use for the remaining cycles of the study was that higher levels of technology use by instructors would provide more data in the student surveys and interviews. The exact number of faculty members selected for cycle two was dependent on how the data were grouped with respect to technology use within those who volunteered to participate in the second cycle of the study.

A total of 19 faculty respondents volunteered to participate in the cycle two interviews and subsequent portions of the study. The participants for the second cycle of the study were drawn from this group, using the following procedure: Responses from these faculty members were subjected to basic analysis in order to determine the frequency of technology use by each faculty. Frequency was determined through the calculation of the sum of the survey responses indicating the frequency of use with individual technologies. Figure 1 on the following page shows the distribution of these scores among the faculty members who volunteered to participate in cycle two. The faculty members invited for the interview are labeled F1 through F9.

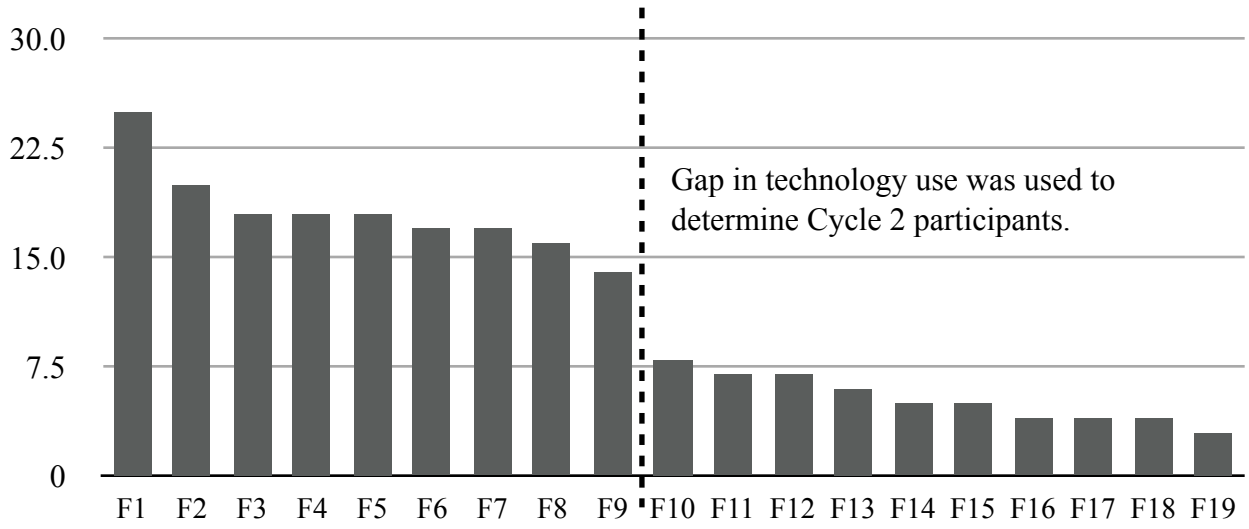

Figure 1. Total frequency of technology use scores from faculty who volunteered to participate in interviews.

Based on the distribution of this data, the nine faculty members who reported the highest frequency of technology use were selected, based on the density of the grouping. The target number of participants for this cycle of the study was 10. The similarity of the frequency of technology use, along with the density of the grouping justified the initial selection of nine participants for cycle two, and the analysis of their interview data was used to ensure data saturation.

Cycle two research design. In the second cycle of the study, nine faculty members were interviewed in person to gather additional data about their approach to technology use in their classes, the types of technology they use, and the intended effects of the technology. The interview guide in Appendix B served as a guide for these semi-structured interviews (Hatch, 2002). This semi-structured interview was composed of some standard, pre-arranged questions and also some follow-up questions generated based on faculty participants' responses to standard questions in the interview, or to their survey responses. Each interview was digitally recorded

and transcribed. The interview transcripts were analyzed using the typological analysis method outlined in Hatch (2002).

Cycle three participant selection. The participants for cycle three of the study were drawn from selected courses taught by the faculty members who were interviewed in cycle two. During the faculty interviews, a single class section was identified by each faculty member based on the technologies offered in the class, and other factors including class size, and convenience for the faculty member. Surveys were administered during the normal class time to the students who were present on that day. Only students over the age of 18 were included in the survey. The total number of students who were enrolled in at least one general education course at Bakersfield College during the Fall term of 2009 was approximately 6,500. The total number of students who were surveyed in the nine classes for cycle three of the study was 295. The average number of students per class who participated in the study was approximately 33, with a range of 13 to 61 students who responded to the survey from each class.

Cycle three research design. In the third cycle of the study, one class from each of the faculty members who participated in cycle two interviews was selected based on the faculty member's technology use in each class. The goal of this selection process was to select a class where the faculty member used a high amount or a similar amount of technology, relative to their other classes. Arrangements were made for the primary researcher to visit each class at a time that was least disruptive to class instruction, during the last four weeks of the Fall 2009 semester. The timing of the survey administration was arranged to ensure that students in the classes had been given a significant amount of time to experience the use of technology in their class. The paper-based survey found in Appendix C was administered to the students in the class, delivered

in person, and introduced by the primary researcher. Participation in the survey by students was optional, and was limited to students who are over the age of 18. Non participating students were allowed to work on other class-related material during this time, at their own discretion. A total of 295 student surveys were collected from the nine classes.

The student survey instrument included questions that measured the students' perceptions of a standard set of instructional technologies, which were developed based upon the specific technologies mentioned in the faculty surveys from cycle one of the study, along with input from the panel of experts. The survey instrument also included qualitative questions that gathered data on what changes students believed would make the technology used in their class more useful. Demographic information such as age and gender was gathered, as well as information on which class the student was registered in so that data could be analyzed in class groups.

Cycle four participant selection. Cycle four of the study was composed of in person interviews with selected students from each class where the survey was administered. Students were selected for invitation to participate in the cycle four interviews based on the data gathered in the in-class student surveys from cycle three. Data were analyzed to rank students according to their overall perception of the usefulness of technology. Survey data were analyzed to determine the relative perceptions of each student with regard to how useful they believed technology to be in the class where they were interviewed. The proposed plan for the selection of interview candidates was to select two students from each class. One of these selections was to have been a student who perceived technology to be highly useful, and the other was to have been a student who indicated a low perception of technology's usefulness in their surveys. However, within the group of 89 students who indicated a willingness to participate in an

interview, there was a significant skewness toward a positive perception of technology's usefulness. This was also true, although to a slightly lesser extent, in the larger group containing all survey respondents. Because there were no students who expressed a strong negative perception of technology's usefulness, the proposed plan of purposeful selection with both positive and negative perceptions could not be followed. The students who volunteered for the interview portion of the study were ranked from high to low according to their indication of technology's usefulness, and contacted in that order. When students did not respond, the next student on the list for each class was contacted until two interviews for each class were completed. In some cases the interview participants were at or near the top of the ranked list. In other cases, the list was completely exhausted in the process of securing interviews. Although a relatively high number of students indicated that they would be willing to participate in an interview, there was a high percentage of students that either would not or could not participate when contacted. The number of students who volunteered to participate in the interviews for cycle four were sufficient that the researcher was able to arrange for two interviews per class, which was the proposed number of participants for cycle four. A total of 18 interviews were digitally recorded and transcribed. Upon examination of the data gathered from the interviews, it was determined that the level of repetition in the interview data provided sufficient data saturation.

Cycle four research design. Cycle four was composed of interviews with each of the students selected using the data from cycle three. The interviews were conducted in-person, on a one-on-one basis by the primary researcher, and were based on the Student Interview guide found in Appendix D. Interviews were semi-structured, and included both standard questions

asked of all students and follow-up questions related to each student's survey responses. One example of this type of question was related to perceptions of a specific technology that was used in the specified class, which was identified from the instructor interview or in that particular student's survey. Probing questions were also used during these interviews with the goal of pursuing additional data that may have relevance to the research questions.

Verification and Ethical Considerations

In quantitative studies, the researcher is concerned with the constructs of reliability and validity. Reliability refers to the extent to which others can reproduce the study with similar effect in other contexts. Validity refers to the extent to which the study measures what the researcher intends to understand through the study. In a qualitative study, the focus is on the unique interpretation of events and the development of insight into a particular phenomenon or event. Thus, the concept of *trustworthiness* comes into play.

In a mixed methods study such as this, multiple methods of ensuring reliability and validity should be employed to gather and analyze data in a way that provides an accurate insight into the situation of focus. Trustworthiness can be achieved through several strategies. In this study, the following strategies were used:

Member checks. Transcripts and interpretive data were reviewed by the faculty participants in the study to ensure internal validity. Faculty participants were invited to comment or add detail to the data set as well, in order to provide additional insight into the study.

External auditor. The summary-form data and the interpretations of the researcher were subjected to an in-depth review by an expert in the area of technology use in higher education. The results of the external audit were used to validate and inform the researcher's interpretation

of the data. The external auditor was Dr. Paul Sparks, Associate Professor in Pepperdine University's Graduate School of Education and Psychology, who also served on the panel of experts. The advantage of this dual role was that the auditor had a level of familiarity with the study that was advantageous in terms of understanding the instruments and the context of the data. The potential negative aspect of this familiarity was similar to that of the primary researcher, in that a false positive finding in support of the research questions could be possible. To mitigate this effect, the auditor's review of the data analysis took place with the data set separated from all demographic and personal information related to the participants. The absence of this information in the review process ensured that the auditor's interpretation of the data was not affected by their own perceptions of how the research questions should be answered. The attestation from Dr. Sparks is found in Appendix D of this document.

Clarification of researcher bias and assumptions. A detailed review of possible areas of researcher bias and assumptions is included in chapter one of the study, to reinforce the concept of trustworthiness in the interpretation of the data.

Rich, thick descriptions. This aspect of trustworthiness refers to the level of detail and depth found in the researcher's description of the data. The description of the phenomenon and behavior being studied should be such that other researchers should be able to "able to recognize the experience after having only read about it in a study" (Sandelowski 1986, pp. 32).

Auditability. Auditability refers to the extent to which an independent reader or another researcher can follow and even replicate the steps and decisions which were taken by the researcher during data collection and analysis. A detailed journal of research actions and

decisions has been kept throughout the study, and was utilized in producing the final research report.

Data Analysis

Quantitative data of the type yielded by the survey instruments in this study were analyzed in a number of ways. The research questions were addressed by the quantitative data in this study by the correlation of *usefulness* and *frequency* data from individual instructors with the data from their respective classes. This correlation revealed the level of agreement in the perceptions of instructors with the students in their class on how frequently technology is used, as well as how useful it is in supporting learning. For ordinal data, including Likert-type scales such as those used in this study, two measures are appropriate for the calculation of the degree of correlation (Blalock, 1979). The first, Spearman's Rank Correlation Coefficient, computes a level of correlation between 1, indicating a perfect positive correlation, and -1, which is a perfect negative correlation. A value of 0 indicates no relationship between the variables. Spearman's Rank Correlation Coefficient, represented by *r*, is computed by squaring the differences in ranks between pairs of ranked ordinal data (Blalock, 1979). Spearman's *r* does not assume a linear relationship among variables, nor does it require interval-scale data. However, it does assume that the distance between the possible values of the variable, such as values on a Likert scale, are equal. In the article "Use and Misuse of Likert Scales" in Medical Education, Pell (2005) stated that the use of Likert scale data can be subjected to parametric analysis, such as the Spearman's Rank Correlation Coefficient, provided that the data set is of the appropriate size and shape, and provided one can reasonably assume that the subjects of the study perceived the choices in the Likert scale to be equidistant from one another. There is no compelling reason that this

assumption can be made regarding the scales used in this study. Therefore, the Spearman's Rank Correlation Coefficient was not appropriate for this analysis.

According to Blalock (1979), the second and more appropriate method of analysis for Likert-type data is Kendall's Tau. While the tau varies between 1 and -1 in the same way that Spearman's *r* does, the method of calculation differs. In calculating tau, the researcher observes differences in rankings within "all possible pairs of cases" (Blalock, 1979, p 436). Kendall's Tau does not require the assumption that the possible selections on a Likert-type scale are equidistant from one another, and therefore it was deemed the more appropriate statistical operation for the calculation of quantitative data in this study. Kendall's Tau was used in the analysis of all quantitative data in the study, in order to address each of the three research questions in the study.

The qualitative data in this study were analyzed using the Typological Analysis model outlined in Hatch (2002). In this model, the researcher begins with typologies in mind to be identified within the data. In many other types of quantitative analysis, the researcher begins in a more open-ended fashion, allowing patterns and ideas to emerge as the data are analyzed. The procedures in typological analysis call for the development of typologies, which are then used to identify themes within the data. Themes are recorded and organized by typology and subsequently analyzed to identify patterns within each typology. Statements are then developed that provide a generalization of the patterns in the data. Specific excerpts from the data are then chosen to support and illustrate the general statements representing the patterns within the data.

In this study, the typologies were defined by the research questions and by the quantitative analysis of the survey data. The results of the qualitative analysis were used in this manner to inform, illustrate, and support the quantitative data in alignment with the triangulation model

outlined in Creswell and Clark (2007). The use of the quantitative data to guide the process of typological analysis creates a link between the data sets which allowed for a connection between the two. Within the triangulation model, according to Creswell and Clark (2007), there are four variants. They are the convergence model, the data transformation model, the validating quantitative data model, and the multilevel model. According to Creswell and Clark (2007), the convergence model within the triangulation design is used when researchers "want to compare results or to validate, confirm, or corroborate quantitative results with qualitative findings" (p. 65). As such, the convergence model was chosen as the most appropriate framework for this study. Creswell and Clark (2007) goes on to state that "The purpose of this model is to end up with valid and well-substantiated conclusions about a single phenomenon" (p. 65). In this case, the qualitative typologies were used as a basis for aligning the qualitative data with the quantitative survey results.

Chapter Four

Results of the Study

Review of the Research Design

The organization of this chapter follows the design of this study, making use of the cycles of the study to provide structure for the discussion of the results. This organization for reporting the data was chosen for two reasons:

1. The data resulting from this study were iterative, where each cycle uses elements from the previous cycle to guide its collection and analysis. Thus, the preservation of the cycles of the study in reporting the results of the study enhanced the meaning of the data.
2. The preservation of the cycles in this study provided a greater degree of connection between the different elements of data. In alignment with the ideas of the triangulation research design (Cresswell & Clark, 2006), these connections allowed a more natural arrangement of the data in order to effectively address the research questions from multiple perspectives.

Cycle one - faculty survey. In the first cycle of the study, the Community College Faculty Technology Use Survey (Appendix A) was administered via the Internet to faculty who were teaching a face-to-face, general education course at Bakersfield College in the Fall semester of 2009. This survey gathered responses from faculty using Likert-type items designed to measure faculty perceptions of the frequency of use and the usefulness of the technologies they used in their classes. In addition, the faculty were asked to describe their goals for technology

use in an open-ended, qualitative series of questions. The quantitative data from the survey were summarized using basic descriptive statistics. Further analysis of this cycle one quantitative data was presented with the cycle three data from the student survey, as these two sets of data were subjected to Kendall's Tau to test for a degree of correlation between the perceptions of faculty and the perceptions of students both overall, and with respect to specific technologies.

Cycle two - faculty interviews. In the second cycle of the study, nine faculty members were interviewed in person by the primary researcher. These interviews were digitally recorded and transcribed, and subsequently analyzed using the typological analysis model. Transcriptions were checked for accuracy with the participants. Typologies were developed using the cycle one data, as well as the research questions for this study. In the presentation of the cycle two results, the data were used to enhance and clarify the quantitative data from cycle one of the study.

Cycle Three - Student Survey. In the third cycle, the Community College Student Technology Survey (Appendix C) was administered to students in one class per faculty member who was interviewed in cycle two of the study. The data from this survey were presented in basic descriptive statistics, and also subjected to nonparametric analysis using Kendall's Tau. The degree of correlation between age and the perceived usefulness of technology was presented, as well as the correlation between students' perceptions and their corresponding faculty members' perceptions of the usefulness of technology in each class.

Cycle Four - Student Interviews. The data collected in cycle four were obtained through interviews with a subset of students who participated in the cycle three survey and who indicated a willingness to participate in the interview portion of the study on the survey form. These data were transcribed, and the text was analyzed using the typological model (Hatch, 2002) following a check for accuracy of the transcripts. The typologies were defined by the themes and results from the data analysis in the previous cycles. These data were presented using the procedures outlined in Hatch (2002), with general descriptive statements and supporting excerpts from the actual data for illustration and clarification. The contextual framework for these statements was developed from the research questions, as well as the quantitative data analysis in order to provide a strong connection between the multiple data sets.

Population and Sample

Cycle one - faculty survey. This study was focused on student and faculty perceptions of the use of instructional technology in community college classes. As defined, instructional technology includes hardware software and other non-computing devices that were used to aid or enhance instruction. This definition does not include technology that was part of the subject matter for the class. For example, the computers in a computer science classroom would not be classified as instructional technology under this definition.

The total number of full time faculty at Bakersfield College was 283. In cycle one of this study, 108 faculty were identified as meeting the criteria for participation in the study. Out of this 108, the total number of completed faculty surveys was 43, or 39.8% of the total eligible faculty. The online survey did not permit the submission of incomplete surveys, so all 43 of the submitted surveys were complete and usable.

Cycle two - faculty interviews. The participants for cycle two of the study were invited from within the group of faculty who responded to the survey, who also indicated on the survey that they would be willing to participate in the rest of the study, including the interview portion and the surveying of one of their classes. Of the 43 faculty survey respondents, 18 faculty, or approximately 41.8%, volunteered to participate in subsequent portions of the study. These faculty were ranked according to their technology use, in order to determine which faculty would provide the most data to observe. The nine highest ranking faculty members, according to technology use, were asked to participate in the interview for cycle two. Each of these nine agreed to participate in cycle three.

Cycle three - student surveys. The participants in cycle three of the study were selected as a result of their enrollment in one of the classes taught by a faculty participant in cycle two. Faculty members who were interviewed in cycle two were asked to select one of their classes where technology was frequently used in instruction. The other criterion for the course selection was that the course needed to qualify as a general education course according to the 2009-2010 Bakersfield College Catalog. Following the selection of an appropriate class, the faculty member and primary researcher collaborated to find a date and time when the negative impact on instruction would be minimized for the administration of the survey to the class. The participants in the student survey for cycle three were the students who appeared in class on the day of the survey administration, who opted to participate, were 18 years of age or older, and who arrived in class prior to the reading of the survey instructions by the primary researcher. Those who opted out, did not hear the instructions, or who were not 18 years of age or older were permitted to work quietly on class assignments while the survey was completed.

The total number of students who responded to the survey was 295, spread across nine classes. The number of students from each class who participated in cycle three ranged from 13 to 61, with a mean of 33. Table 1 below contains the number of participants from each class, where the classes are labeled using the series C1:C9.

Table 1

Student Survey Participants by Class

C1	C2	C3	C4	C5	C6	C7	C8	C9
27	18	33	24	44	50	13	61	25

There was a high degree of variance in the number of students per class. This variance is the result of naturally-occurring differences in enrollment across subjects, and differences in class capacity. For example, a lecture-based Health Education class in a large lecture hall would have many more students than an English Composition class. One of the assumptions of this study was that classroom size did not affect the student or faculty responses to the survey and interview questions, as the students' interactions with the technologies used in the classes did not change as a result of the number of students in the class.

Cycle four - student interviews. The selection of participants for cycle four of the study was delimited to the group of students who responded to the student survey and further limited to those students who indicated that they would be willing to participate in the cycle four interviews. Students were informed by the primary researcher as part of the survey instructions as to the nature and overview of the interviews. Students who were willing to participate in the interview process were asked to include their name and contact information in the provided spaces at the end of the survey. It was made clear to the students that their participation in the

interview portion of the study was voluntary, and not required as part of their participation in the survey. Students in each class were given the same instructions, and the same survey. Despite measures to control the external factors that may affect student availability for interviews, there was variance in the percentage of students who completed surveys who were also willing to participate in an interview. The percentage of students who volunteered for an interview as a subgroup of the number from each class who responded to the survey ranged from 10% to 48.15%, with a mean of 31.97% and a standard deviation of 11.98. The number of interview volunteers, as well as the percentage of the survey respondents who volunteered to be interviewed from each class are listed in Table 2 below.

Table 2

Surveys Returned and Interview Volunteers by Class

	C1	C2	C3	C4	C5	C6	C7	C8	C9
Surveys Returned	27	18	33	24	44	50	13	61	25
Volunteers	13	6	9	8	14	5	6	23	5
Volunteer Rate	48%	33%	27%	33%	32%	10%	46%	38%	20%

The students who volunteered to be interviewed were then ranked according to their technology use, and were asked for an appointment to interview with the primary researcher on the Bakersfield College campus within two weeks of the original survey date for their class. Students were ranked according to their reported use of technology in order to obtain the most data on technology use and perceptions from student interviews. Students were contacted using the information that they provided on the survey form, which was either a telephone number or email address, or in some cases both. The target number of interviews for each class that was

surveyed was two. This number of student interviews was achieved, although in some cases the number of volunteers for each class was completely exhausted in order to achieve the desired number. In every class, there were a number of students who volunteered to participate in the interview, and were contacted for an appointment, but either did not respond to the contact made by the researcher or were not able to participate in the interview. As a result, the composition of the students who were interviewed varied with regard to their use and perception of technology, such that no assumption or statement of significance can be asserted regarding this aspect of the selection process. In summary, students who reported both high and low scores for the frequency and usefulness of technology were selected. Table 3 below illustrates the overall breakdown of the number of students who were contacted and did not return either phone call or email, were contacted but declined to participate, participated in the interview, or were not called because the desired number of interviews for their class was reached.

Table 3

Student Contacts and Responses for Interview

	Number	% of Total
No Response	29	36%
Not Contacted	24	30%
Declined	10	12%
Participated	18	22%

Demographic Analysis

In cycle one of the study, no demographic data were collected from the faculty survey respondents, due to the lack of a connection with the research questions guiding the study.

Neither the faculty member's age nor gender was an independent variable in the study, and therefore the researcher did not include them in the survey questionnaire.

In cycle two, more detailed data were available through the interview process, including both gender and the number of years each faculty member had been teaching full time. Of the nine faculty members who were interviewed as part of cycle two, three were male and six were female, presenting a female to male ratio of 2:1. This was similar to the female to male ratio of of faculty who volunteered for the interview, which was 2.16:1. The number of years of experience teaching full time was obtained from each faculty member during the interview, by direct question. The responses to this question ranged from five to 20 years, and the mean number of years was 12.78, with a standard deviation of 4.71. Since this question was asked during the interview, there were no data for full time teaching experience available from those who volunteered to interview, but were not selected.

The number of students who participated in the survey in cycle three was 295. One hundred percent of the submitted surveys presented a sufficient amount of usable data to be included in some part of the study. There were 6 surveys that were not complete, missing demographic data. Surveys that contained all of the requested demographic data were considered complete, as the perception of technology could include a lack of response or opinion. The students who participated in the survey ranged from 18 to 48 years of age. The mean age for participants in cycle three was 21.53 years, with a standard deviation of 5.20 years. The age distribution in this sample group was heavily skewed to the left, with a mode of 19 years. The shape of the age distribution is represented by Figure 2 on the following page.

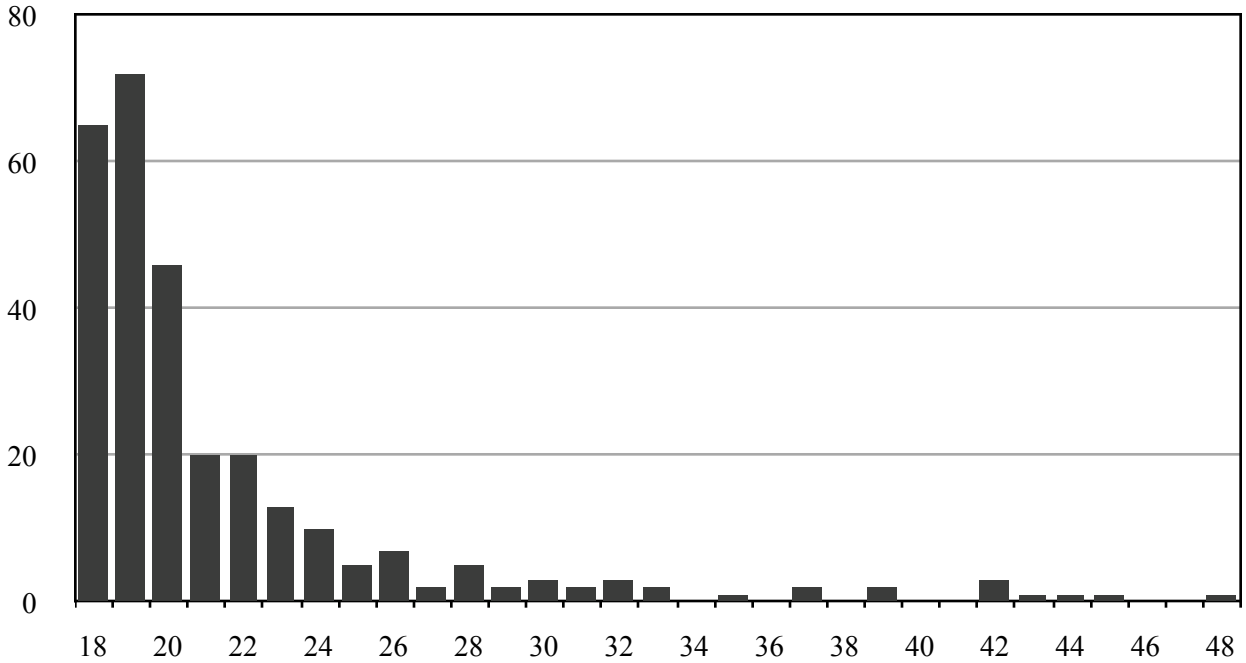

Figure 2. Frequency Histogram of Age for Student Participants

The population of students at Bakersfield College who were taking at least one general education class on the main campus during the fall semester of 2009 was 13,523, according to the Bakersfield College student information database. The age breakdown shows a similar shape to the distribution of ages in the sample group, when the sample group is grouped into the same categories as the population data and shown as a percentage of the population. Table 4 on the following page shows the comparison of the age breakdown between the sample who participated in the study, and the population of students who were enrolled in at least one general education course.

Table 4

Population and Sample Age Breakdown

Age Group	Population	Sample
< 19	33.60%	48.47%
20 - 24	37.50%	36.95%
25 - 29	11.80%	7.12%
30 - 39	10.20%	5.08%
40 - 49	4.70%	2.37%
> 50	2.20%	<1%

The gender breakdown of the students who participated in cycle three of the study was such that 43.05% of the students were male and 56.95% of the students were female. The student population was composed of 57.8% female students and 42.1% male students. Therefore, the gender breakdown of the sample closely matched the population from which it was drawn. The gender of the participants in cycle three of the study was determined by each participant's response to a direct question regarding gender on the survey. One hundred percent of the students who completed the survey responded to this question.

Results of the Study

Cycle one - faculty surveys. In cycle one of the study, Bakersfield College faculty who were teaching full-time with at least one course being taught in a general education area were invited to participate in an online survey that asked quantitative and qualitative questions related to their technology use and perceptions of technology's usefulness in their classes. The survey was adaptive, meaning that responses given early in the survey were used to generate questions later in the survey. The survey's ability to adapt to the responses given by each user was designed to focus user responses on the technologies that were identified by the users themselves

in the first set of survey questions. By doing so, the instrument ensured that each technology mentioned by faculty respondents was rated on usefulness and frequency of use in the subsequent parts of the survey.

Cycle one of the study produced both quantitative data and qualitative data. These data provided a perspective on faculty perceptions and use of technology in their classes, as well as some faculty members' rationale for using technology. In the first set of questions in the survey, faculty were asked to list the five most frequently used technologies in their classes, and to rank each one as to the frequency of its use using a Likert-type scale, which resulted in values between one and five. Faculty were free to submit any technology they chose in this section, so there were a variety of answers. In some cases single technologies were represented by several different terms.

In the analysis of the data, these differing terms were combined into groups of similar technologies. For example, *web site with syllabus*, *online class information*, and *class web site* were all grouped together as one technology type, *class web site*. Video-based technologies of various types, whether DVD-based, internet-based video, or labeled with the generic term *video* were all grouped together, using the rationale that despite the variety of the sources of the video used, the instructional use and effect is the same. Contained in the survey responses, there were two mentions of *chalkboard*, and one mention of *overhead projector*. While these may be viable tools for teaching, they were excluded from analysis in this study because they are not commonly considered *technology*. Some faculty mentioned five technologies that were all used in the survey, while others mentioned only one or two technologies. Survey responses where at least one technology was listed were considered valid, and were included in the data set.

After the various answers were grouped and compiled, a total of 18 different technologies were identified in the faculty survey data set. The frequency with which each technology was reported ranged from 31 to one. Figure 3 below shows the distribution of the percentage of faculty respondents who reported the use of each technology on the survey, after the functionally equivalent responses were grouped. This data establishes the technologies which were most frequently used in classes in order to guide the development of the student survey and interview guide.

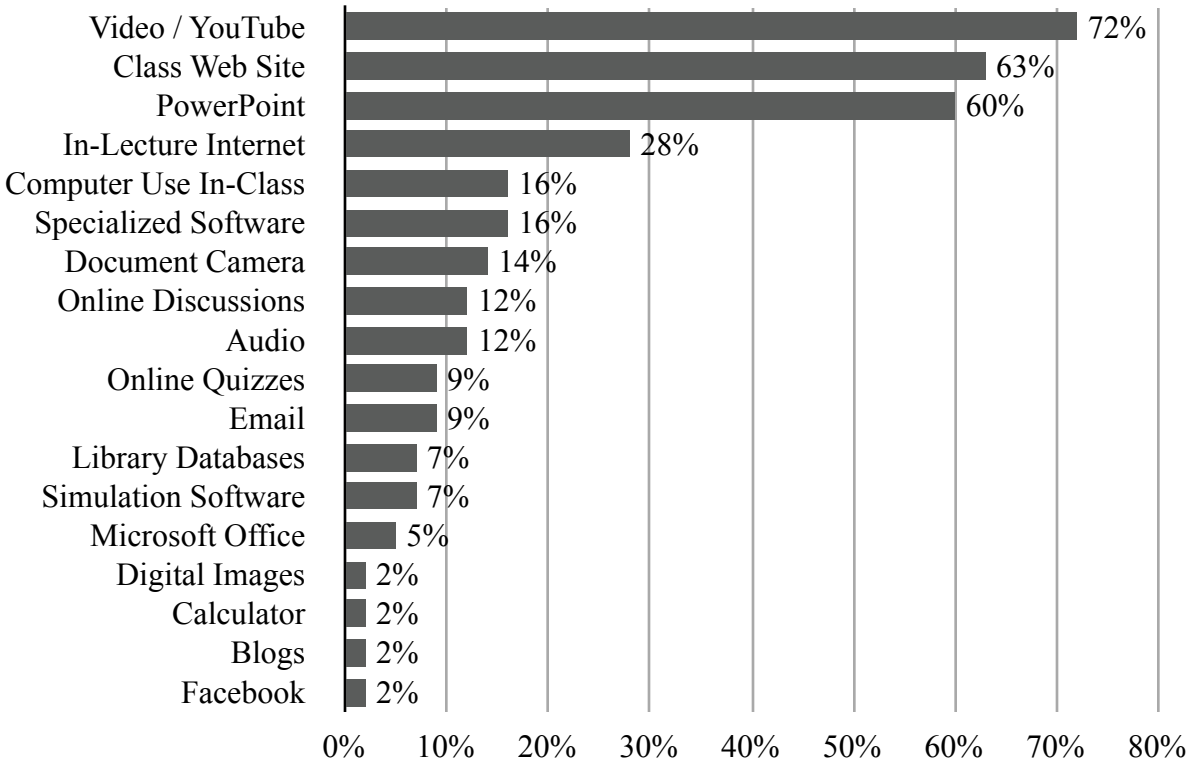

Figure 3. Percentage of faculty respondents using specific technologies, by technology

The most frequently-mentioned technology among faculty respondents was video, with 31, or 72% of respondents reporting the use of video of some type in their classes. Video included DVD and VHS, as well as Internet-based sources such as YouTube. In some cases, the type of video was unspecified. The use of a class web site was reported by 27, or 63% of

respondents. This included any online resource that was created and established by the instructor, apart from online discussions and online quizzes that were grouped separately. The third most frequently-used technology was Powerpoint, which was mentioned 26 times. Powerpoint use was not grouped, as each mention of this technology was a direct and specific mention which included the exact name of the technology.

After Powerpoint, there was a significant decline in the number of users per technology. The next most frequently used technology was in-class Internet use. This grouping included the demonstration of web sites, and other internet or web-based resources that were shown in classes, excluding the more specific category of online videos, which were grouped with the other mentions of video. In-class Internet use was reported by 12 faculty members, a decline of 53.85% from the number of users reporting the use of Powerpoint. Specialized software was the next most frequently-used category, with seven faculty reporting the use of such technology. This category included any software that was specific to the subject matter of the class. For example, a faculty respondent who taught a math class indicated the use of Maple software, which is software that is designed specifically for Math instruction. In class computer use by students was also indicated by seven faculty members. This category included any use of computers in classes where students were allowed the use of their own computer, and where that use did not fall into a more specific category, such as the previously mentioned Maple software. Had this category included the more specific uses, then the number of faculty who indicated its use would have numbered 21. Below the category of Specialized Software, there were 12 technology groupings whose use was indicated by fewer than seven faculty respondents. Of those, four technologies were mentioned by only one faculty member each. The frequency

distribution of the number of faculty who used each type of technology mentioned in the survey showed a significant difference between the three most frequently mentioned technologies, and the fourth most frequently mentioned, as well as between the fourth and fifth.

In addition to identifying their five most frequently used technologies in the first five items of the survey, faculty members were asked to rate the frequency with which they used each of the technologies they mentioned. The technologies were rated using a five-point Likert-type scale, ranging from *often* to *not often*, where the choices were scored with values ranging from one to five, respectively. For each technology grouping, the responses were totaled and then divided by the number of faculty who indicated use of that technology, resulting in a mean for the perception of frequency of use for each technology.

The range of the mean frequency of use was 3.00 to 5.00, indicating that faculty respondents perceived a high frequency of use for those technologies they elected to use in their classes. It should be noted in the examination of these data that the bottom nine mean values in the chart (Online Quizzes through Facebook) had an *n* of less than five, so in those cases the mean for technology use may not have been as meaningful.

In the faculty survey, participants also indicated perceived usefulness of each technology mentioned in the first set of survey questions, using a Likert-type scale ranging from 5 (Very Useful) to 1 (Slightly Useful). The scale did not include a low-end value that included a rating representing “not useful”, as the study assumed that at least some usefulness was perceived in the act of choosing to use a technology in a class environment. The responses related to usefulness were summarized using the same set of technology categories used in summarizing the response set related to perceived frequency of use. The mean values for perceived usefulness of each

technology group ranged from 3.80 to 5.00, indicating that in general, faculty participants perceived a high level of usefulness in the technologies which they chose to use. Figure 4 below shows the mean value of the perceived usefulness for each technology group. Figure 4 includes four technologies which were rated as being most frequently used by faculty respondents. The lower-rated technologies were not used significantly enough to permit further analysis.

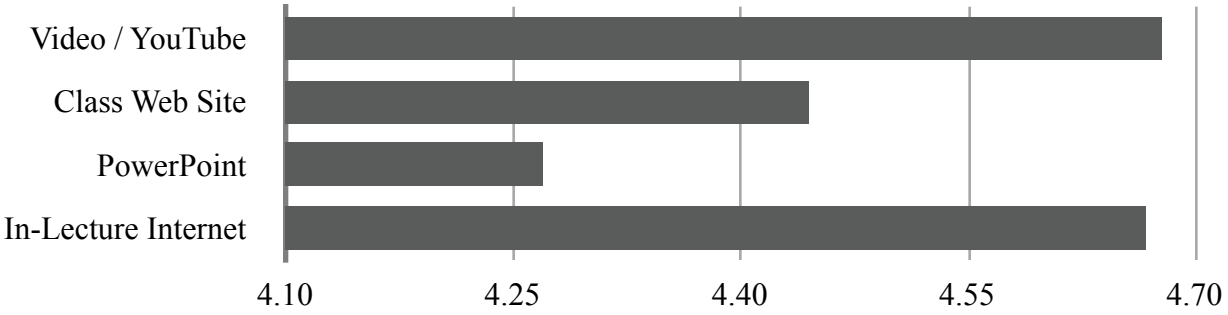

Figure 4. Faculty Perceptions of Usefulness by Technology

The categorical nature of these data limits the number of discrete values, making visualization using a scatter plot difficult. The data on perceived frequency of use and perceived usefulness were analyzed using Kendall's Tau to determine whether there was a relationship between the two variables. The results of this analysis are found in Table 5 below.

Table 5

Kendall's τ for Faculty Perception of Frequency of use and Usefulness

			Frequency
Kendall's tau_b	Usefulness	Correlation Coefficient	.429**
		Sig. (2-tailed)	0.000
		N	134

**. Correlation is significant at the 0.01 level (2-tailed).

Each pair of perceived frequency of use and perceived usefulness was analyzed, resulting in 134 pairs of data. The number of technologies mentioned by each faculty participant

ranged from one to five, which resulted in an average of 3.27 (N = 134) technology-based pairs per faculty member. Analysis of the relationship between frequency and usefulness across all technologies using Kendall's Tau showed a statistically significant relationship (τ = .429, p = .01). This result indicates that as faculty perceptions of the frequency of their own technology use increased, their perception of the usefulness of that technology also increased. This follows a logical analysis of perception of usefulness as a possible motivator for frequency of use.

Summary of cycle one findings. The survey responses from 43 faculty members who participated in cycle one of the study included both quantitative and qualitative response types. These data were used to guide the invitation of nine faculty members to participate in the interview portion of the study in cycle two, and by extension the selection of courses and students to participate in cycle three and cycle four. Additionally, the cycle one data yielded a picture of which technologies were used by these faculty, as well as how often they used them, how useful they were perceived to be, and even some of the goals that these faculty had for their use.

Faculty participants were asked to share the technologies that they used most often in their classes. In the analysis of the data, their responses were combined into technology groupings based on similarity in order to facilitate analysis. A total of 18 technology groupings were created, which represented 135 specific technology mentioned. The most commonly-mentioned mentioned technologies were video, class web sites, and PowerPoint. Each of these top three most frequently mentioned technologies was mentioned more than twice as often as the fourth most frequently mentioned technology. The four least-mentioned technologies were only mentioned once.

Each technology mentioned was rated from one to five on frequency of use, and from one to five on perceived usefulness by each faculty participant. The mean for frequency of use for each technology ranged from 3.00 to 5.00. The mean score for perceived usefulness for each technology ranged from 3.80 to 5.00. The relationship between the frequency of use rating and the perceived usefulness rating for all technologies together was analyzed using Kendall's Tau. A positive, significant relationship was found to exist between how frequently faculty used technology, and how useful they perceived it to be. Overall, it should be noted that faculty participants perceived a high level of usefulness across the technologies that appeared in the data.

Cycle two - faculty interviews. Typological analysis was again used to analyze the qualitative interview data, with the objective of identifying typologies, and subsequently themes that were complimentary to the quantitative data from cycle one and paramount to the research questions of the study. By this standard, the typologies for the analysis of the faculty interview data were derived from the interview data and guided by the research questions for the study.

The first typology to be analyzed was faculty members' experience and background with technology. This has relevance to the faculty members' perception of the usefulness of instructional technology as it appears in the primary research question, because their use of technology provides a context from which they perceive their use of technology in the classroom. This typology also reveals themes which may correspond to some of the faculty members' choices for technology use in their classes.

The most prominent theme within this typology was universal to every faculty interview participant. Specifically, every faculty participant indicated that they used technology outside of

the context of their academic work with high frequency. The majority of the participants indicated a narrow set of frequently-used technology applications outside of the work context. Email and web browsing were the highest category of use. Other uses included computers for specific work-related applications at a previous job, as well as various multimedia applications and the use of technology in conjunction with graduate research. When asked specifically about the use of social media tools and mobile technologies such as smart phones, the participants almost universally expressed a low perception of personal or professional usefulness in the use of these technologies.

A second theme found in the interview data within the faculty technology use and experience typology was the origin of the participants' technology knowledge and experience. Other than two who mentioned participation in some of the training opportunities provided by the college, participants either credited previous work experience or their own learning efforts for their ability to use technology. One participant stated, specifically, "I'm kind of self-taught – I guess – really – I don't know that I've learned anything specifically here." Another stated, "Most everything I know I have learned outside of BC." This pattern of self-taught technology use has value in the context of this study, as it is a pattern commonly attributed to younger generations in much of the literature on generational differences in technology use (Prensky, 2001a; Tapscott, 1998). While this finding does not dispute the idea that younger technology users are largely independent learners of technology, it does weaken the contrast drawn between generations in this body of literature by revealing a trend of similar independent technology learning within the faculty participants in this study. Despite their proficiency in using technology, and their universal use of technology outside of the work environment, the faculty

who participated in this study made several statements that, contrary to their proven abilities, reflected a belief that younger generations were proficient in using technology while older generations were not. While the faculty did not specifically cite the generational viewpoint of explaining differences in technology use and proficiency, there is evidence that they have some exposure to it: "you can almost draw a line – you know – if they're over 30 they're more likely to have struggles with the technology..."

The second typology within the faculty interview data was the set of technologies used, and the factors in choosing which technologies to use. The prominent theme within this typology was that faculty participants did not have an interest in a breadth of different technologies being used in their classes, nor did they have an interest in using the technologies they chose in a variety of different ways. Faculty participants chose a narrow set of technologies within their classes, and used them in very focused, specific ways. Participants chose technologies based on specific instructional goals, and their use of those technologies reflected those same goals. These uses of technology were guided by the faculty participants' views of how students learn and how students perceive and relate to technology. For example, one faculty participant explained their use of technology as a desire to remain relevant to students: "but I think in their minds if you are using something they use ... our information is supposed to remain current so I think the way we deliver it should be current." Content was also a big factor in the selection of technologies in order to meet specific instructional goals. The availability of specific content that met instructional goals in a specific technology format was cited often as a factor in the adoption of a technology. For example, faculty participants indicated that they selected Powerpoint for use in their classes because publisher content had

been made available to them in that format. The following quote from a faculty interview illustrates this theme: "...then it (course content in electronic form) started coming out with our textbooks and it was so easy to use and it was right there and you could talk from that..." Other faculty chose video resources to illustrate or demonstrate specific concepts from their lectures, "Based on content ... I'll use YouTube or video clips from the news or different places that I can find that are relevant to the class."

The third typology identified within the faculty interview data was faculty plans for growth and improvement in their technology use. When asked what new or different technologies they would like to explore as possible additions to their teaching repertoire, two themes were evident in the faculty participants' responses. First, although the researcher's expectation was that in response to this question, faculty would indicate technologies or types of technologies that were categorically different, the faculty responses showed a pattern of incremental change from what they were currently using. Faculty participants indicated that they would like to learn to do new things with the technologies they already use, or even use them more or more effectively, such as "I was thinking about doing an online chat," or "maybe my own personal videos."

Within this typology, a secondary theme was the desire to use more online tools to augment their face to face classes. Both asynchronous tools (blogs, discussion forums) and synchronous tools ("I was thinking about doing an online chat.") were mentioned. This is a noteworthy development, because all of these tools represent technologies that are removed from the classroom context, and yet their mention outnumbered specific technologies that were classroom-oriented.

The fourth typology used in the analysis of the faculty interview data was the identification of barriers to the use of technology, or negative aspects of technology use. Within this typology, several themes were identified. The most prominent theme within this typology was concern that technology would work as planned when it came to using it in the classroom. The following quotes illustrate this theme: "I think that's kind of what we're susceptible to is failures – equipment failures – that's probably it," and "There's always the risk – like today – I had a little glitch at the end." Faculty who use technology in their classes seem to be prepared for the reality that technology might not work as planned: "one of the biggest things that I've had to do is create some backups because even this semester I've had ... a couple of frustrating days..." Frustration was frequently expressed in relation to technology malfunction in the classroom, as one faculty participant stated, "that was really frustrating because I -- I was trying, trying, and trying and I could not figure out the sound problem..." Within this typology, the prominent theme was connected with another theme found in the same set of interview responses. The connected theme within this typology was an expressed feeling that inadequate knowledge or training was a barrier to the use of technology in the classroom, both specifically for the faculty participants, and in their perception, for the faculty at the college in general. For some faculty, this seemed to be the defining factor in their picture of whether technology is useful: "So it gets back to training. If we really know how to use the technology right, it's great. If we don't know how to use it right, it's horrible." Training was a much more prominent theme than support for technologies in the classroom. Almost universally, the faculty interview participants assumed the responsibility for making the technology work in their own classroom. While the group was divided between those who felt that most of the time they could fix it

themselves, as one faculty put it, "... nothing that I haven't been able to fix," and those who felt that they lacked the training and knowledge to do so, faculty rarely spoke of needing more technical support from the department in charge of technology on campus. Faculty who did not feel that they had the time and ability to fix common problems with technology in the classroom often cited lack of time and/or training to do so. This theme is illustrated with the following quotes: "I think it is time to sit down and learn it – just to figure it out – you know – really and to experiment with it to use it.", and "you have to create – it takes time to learn it and use it and practice with it."

The final typology in these data contains an element of quantitative data. Each of the faculty participants was asked to estimate, based on their interactions with students in their classes, the percentage of students which they believed to be "fluent with technology" and the percentage of students in their classes which had a computer in their home. It should be noted that these questions were designed to measure the faculty member's perceptions of the students in their classes, rather than an accurate measure of fluency or computer ownership. Table 6 on the following page summarizes the quantitative responses given in the faculty interview for both the question of student fluency and the question of student computer ownership, as well as the mean average for both of these response sets.

Table 6

Faculty Perceptions of Student Fluency and Ownership

Faculty Participant	Fluency	Ownership
F1	20%	50%
F2	100%	100%
F3	10%	40%
F4	66%	55%
F5	70%	70%
F6	10%	60%
F7	65%	50%
F8	15%	30%
F9	20%	30%
Mean	41.78%	53.89%

Each faculty member was given the same definition of fluency: "Students who are fluent would be able to use technology in basic ways without problems - to use email, type a paper, and conduct research online." In addition to the requested percentages for each question, many faculty also responded in qualitative ways that provided additional information about their perceptions of students. Many of these responses centered around the number of students who still could not operate a computer efficiently, such as "There are still some that struggle to use even the most basic technology." Faculty also cited anecdotal evidence from their interactions with students to support their quantitative responses, including student writing assignments, email interactions, and student responses to their own technology use. The response set indicated that faculty perceive their students to be somewhat polarized in their technology expertise. In other words, in their interviews faculty gave indirect cues that they perceived most students to be either very fluent in their technology use, or to have almost no knowledge of its use. In some cases, faculty members felt it necessary to include basic instruction in the use of

technology as part of their lectures, in order to compensate for the perceived lack of knowledge in their class: “I have found that some of them I have to kind of show them how they’re gonna download a Podcast. I’ll go on the Internet ... and go to my website and I’ll say, Okay this is my website and this is what you’re gonna do...”

Also within this typology, faculty were questioned as to the percentage of students that they believed to have had access to a computer in their home. Again, faculty had no direct knowledge of this, and were basing their responses on the anecdotal evidence gathered through their interactions with students. However, the faculty members’ perceptions of student technology and computer ownership were related to the research questions in this study, because these perceptions were factors in the way that faculty members choose to use technology in their classes. Faculty were more direct in their response to this specific question. There were no usable qualitative data related to this question, although each faculty participant did respond with a quantitative figure.

The mean value for ownership among the responses given by the faculty interview participants was 56.88%, which was slightly higher than the mean value for fluency, which was 44.5%. In examining Table 6 on the previous page, one can see that all faculty members, except two, perceived the number of students in their classes who had access to a computer at home to be greater than or the same as the number of students who were fluent in using technology. In the two cases where the perception of fluency was rated higher than the perception of ownership, the disparity between the two figures was relatively small, at 11 and 15%, which were F4 and F7 in Table 6. The dispersion of the values in each of the two collections of data were significantly different from one another. The variance for the perceived fluency of students was 10%, while

the variance for perceived ownership of technology was 4.21%. While the small number of values in this data set made these figures less reliable for the purpose of generalization to a larger population, the figures are interesting in the context of the rest of the data obtained from the faculty participants.

Summary of cycle two. The data from cycle two of the study reveal a strong inclination and sense of responsibility among the faculty to learn to use the technology, and to become more self-sufficient in its use. Each faculty member who participated in cycle two indicated that they used technology frequently outside of their classes, for a variety of personal reasons.

Faculty participants recognized that technology does not always work as planned, and that it can be a complex undertaking to use it effectively. However, acknowledged that even if they did not currently possess the knowledge and training to be self-sufficient, that given the time and opportunity to do so they could learn what was needed. Each of the faculty participants in cycle two of the study expressed a desire to learn more and expand their use of technology, either in the same areas or into new technologies, especially online technologies. Faculty participants perceived that their students were more likely to own a computer than they were to be fluent in using technology, as a whole, although there was significantly more agreement between the faculty members on computer ownership than there was on the issue of student fluency with technology use.

The faculty interview data depicted the average faculty member as capable of using technology in a variety of ways, both inside and outside of the classroom. They have a desire to use technology in their classes, and would like to expand the use of technology into new, but related or incrementally different areas based on what they currently use technology for in their

classes. Faculty members recognize that there are several limitations to the better use of technology, including the need for more training, time to learn the technology, and the budget to properly equip their classes. However, faculty members did not indicate that personal limitations were a barrier to the adoption of technology. Faculty participants indicated that there was a significant portion of students who knew how to use, and had access to technology, but there was also a large number who had little or no exposure and access to technology.

Cycle three - student surveys. The total number of students who participated in the survey for cycle three was 295. The average number of students per class who participated in the study was approximately 33, with a range of 13 to 61 students who responded to the survey from each class. Table 7 below details the number of students, as well as the mean age and minimum and maximum age for each class.

Table 7

Student Participant Count and Age by Class

Statistic	C1	C2	C3	C4	C5	C6	C7	C8	C9
Count	27	18	33	24	44	50	13	61	25
Mean Age	19.89	24.39	22.53	23.71	21.37	20.74	21.38	20.08	23.24
Min	18	19	18	19	18	18	18	18	18
Max	39	37	39	48	42	42	43	30	44

The gender breakdown of the participant group was also compared to the same population that was used in the age comparison. In this case, the values were very similar. In the population, females made up 57.80% of the students, while in the sample of students who participated in the survey, 56.95% were female. The difference between the sample and

population in the ratio of female to male was less than one percent. It can be stated that on the basis of gender, the sample is representative of the population from which it was drawn.

The student surveys asked participants to rate the frequency of use and the usefulness of eight different technologies which appeared in the faculty survey in cycle one of the study. The students were instructed to respond to these items specific to the class where they were responding to the survey. The student participants' responses for the frequency of use and the usefulness of each technology were paired with their instructors' responses for that technology. Pairs where the student indicated that technology was not used, or where one of the values was missing from the pair were left out of the analysis, resulting in a total of 787 pairs each for frequency of use and usefulness. A total of 58 pairs were left out of the analysis where one value was missing. These cases occurred where students marked a score of zero for frequency of use, but marked a response to the question of usefulness regarding the same technology. The 787 complete pairs were analyzed for correlation between faculty and student perceptions of the frequency of use and the usefulness of technology, using Kendall's Tau. This correlation addressed key aspects of the primary research question of this study, as the extent to which these pairs correlated indicated the extent to which students and faculty had similar perceptions of the technology used in their classes. The data were analyzed as a single group, including all classes and all types of technology. The data were also analyzed in groups by class and by technology, in order to gain a more specific analysis of the data.

Table 8 on the following page shows the results of Kendall's Tau analysis for all 787 pairs of data, for both frequency of use and usefulness. The results show a statistically significant correlation between the student perception of frequency of use and the student

perception of usefulness. This relationship between these two variables follows a similar pattern to what was observed in the equivalent faculty variables. In other words, both students and faculty who perceived technology to be used more often also were likely to perceive technology to be useful to learning. The Tau analysis also revealed a relationship between faculty members'

Table 8

Kendall's τ for All Pairs of Data

		S_F	S_U	F_F	F_U
S_F	Correlation Coefficient	1.000			
	Sig. (2-tailed)	.			
	N	787			
S_U	Correlation Coefficient	.431**	1.000		
	Sig. (2-tailed)	0.000	.		
	N	736	736		
F_F	Correlation Coefficient	.239**	.134**	1.000	
	Sig. (2-tailed)	0.000	0.000	.	
	N	787	736	787	
F_U	Correlation Coefficient	-0.010	0.005	.199**	1.000
	Sig. (2-tailed)	0.762	0.885	0.000	.
	N	787	736	787	787

Note. Key for all Kendall's Tau tables using frequency and usefulness data:

S_F = Student perception of Frequency of Use
S_U = Student perception of Usefulness
F_F = Faculty perception of Frequency of Use
F_U = Faculty perception of Usefulness

**. Correlation is significant at the 0.01 level (2-tailed).

perception of frequency and both student perception of frequency as well as usefulness of technology. A significant relationship was found to exist between faculty perception of usefulness and faculty perception of frequency of use. This finding supported the literature which states that perception of usefulness is a contributing factor to technology use. There was

not a significant relationship between faculty perception of usefulness and either student variables.

The same data were also analyzed by group using the existing classes to separate the data into groups. There were nine groups total. In some groups, there were not enough unique values within the data set to provide a Tau analysis for every combination of the four variables. In those cases, the corresponding cells are blank. By grouping the data by class, one can see the relationships that exist within each class according to the variance in the values given to different technologies by the faculty member, and how those values relate to the students perceptions of those same technologies. In some cases, the amount of data or the lack of variance in the faculty perceptions of either the technology's usefulness or the frequency of use for each technology, or both, resulted in an inability to calculate a correlation coefficient for the faculty variables. This is a known weakness of Kendall's Tau. This statistical procedure was used in conjunction with qualitative data analysis to present as clear a picture as possible of faculty and student perceptions of technology.

Data from Class 1 is reflected in Table 9 on the following page. There were 81 sets of data resulting from this class. The analysis found a significant relationship between the Student Frequency variable and the Student Usefulness variable ($\tau = .468$, $p = .01$), but there were no other significant relationships within this group of data. There is no correlation between Faculty Usefulness and Faculty Frequency data, since the same faculty member's data was represented in each set of data. The same is true for each of the subsequent sets of data for each class group.

Table 9

Kendall's τ for Data from Class 1

			S_F	S_U	F_F	F_U
Kendall's tau_b	S_F	Correlation Coefficient	1.000			
		Sig. (2-tailed)	.			
		N	81			
	S_U	Correlation Coefficient	.468**	1.000		
		Sig. (2-tailed)	0.000	.		
		N	77	77		
	F_F	Correlation Coefficient	0.067	0.132	1.000	
		Sig. (2-tailed)	0.506	0.219	.	
		N	81	77	81	
	F_U	Correlation Coefficient	0.067	0.132	1.000**	1.000
		Sig. (2-tailed)	0.506	0.219	.	.
		N	81	77	81	81

** Correlation is significant at the 0.01 level (2-tailed).

Class 2 data is reflected in Table 10 below. There were not sufficient data to produce valid results for correlations with faculty frequency. There was a statistically significant,

Table 10

Kendall's τ for Data from Class 2

			S_F	S_U	F_F	F_U
Kendall's tau_b		Correlation Coefficient	1.000			
	S_F	Sig. (2-tailed)	.			
		N	36			
		Correlation Coefficient	.399**	1.000		
	S_U	Sig. (2-tailed)	0.008	.		
		N	34	34		
		Correlation Coefficient	.	.	.	
	F_F	Sig. (2-tailed)	.	.	.	
		N	36	34	36	
		Correlation Coefficient	-.678**	-0.218	.	1.000
	F_U	Sig. (2-tailed)	0.000	0.188	.	.
		N	36	34	36	36

**. Correlation is significant at the 0.01 level (2-tailed).

strong negative correlation between student frequency and faculty usefulness variables. This indicates that technologies that were perceived to be more useful by faculty members were perceived to be used less frequently by students. This relationship is in opposition to the relationship between the student frequency and student usefulness variables, which showed a positive correlation which was also statistically significant. In summary for this class, technologies that were perceived to be used less frequently by students were perceived to be more useful by the instructor, but less useful by the students in the class. There are factors, however, that make this result less valid: First, there were a relatively small number of pairs in this group. Second, there were only two technologies from the student survey that were used in the class according to the instructor.

Table 11 below contains the results from the Tau analysis for Class 3. The data from Class 3 showed statistically significant, positive correlations between the faculty frequency

Table 11

Kendall's τ for Data from Class 3

			S_F	S_U	F_F	F_U
Kendall's tau_b		Correlation Coefficient	1.000			
	S_F	Sig. (2-tailed)	.			
		N	99			
		Correlation Coefficient	.601**	1.000		
	S_U	Sig. (2-tailed)	0.000	.		
		N	74	74		
		Correlation Coefficient	.677**	.439**	1.000	
	F_F	Sig. (2-tailed)	0.000	0.000	.	
		N	99	74	99	
		Correlation Coefficient	.	.	.	.
	F_U	Sig. (2-tailed)	.	.	.	.
		N	99	74	99	99

** Correlation is significant at the 0.01 level (2-tailed).

variable and both the student frequency and student usefulness variables. There were not sufficient data for the faculty usefulness variable to be included in the Tau calculation.

Table 12 below contains the results from the Tau analysis for Class 4. In this group of data, there were not a sufficient number of pairs of data to calculate the Tau for faculty usefulness with any other variables. However, the student frequency variable was positively correlated with student usefulness at the .05 level, and with faculty frequency at the .01 level. This analysis indicates that technologies that were perceived as being used more frequently by students were also perceived as being used more frequently by the instructor, and in a less significant manner, were seen as being useful by students in this class.

Table 12

Kendall's τ for Data from Class 4

			S_F	S_U	F_F	F_U
Kendall's tau_b		Correlation Coefficient	1.000			
	S_F	Sig. (2-tailed)	.			
		N	48			
		Correlation Coefficient	.287*	1.000		
	S_U	Sig. (2-tailed)	0.034	.		
		N	45	45		
		Correlation Coefficient	.670**	0.201	1.000	
	F_F	Sig. (2-tailed)	0.000	0.160	.	
		N	48	45	48	
		Correlation Coefficient	.	.	.	.
	F_U	Sig. (2-tailed)	.	.	.	.
		N	48	45	48	48

*. Correlation is significant at the 0.05 level (2-tailed).
**. Correlation is significant at the 0.01 level (2-tailed).

Table 13 on the following page contains the results from the Tau analysis for Class 5. In this set of data, there were 176 unique pairs of data. There were not sufficient data in this class to properly calculate the Tau for the faculty frequency variable with other variables. In this class,

the Tau resulted in only one significant relationship. Student perception of frequency in this class was positively correlated with student perception of usefulness at the .01 level. No relationship was found between faculty perception of usefulness and student perception of usefulness in this class.

Table 13

Kendall's τ for Data from Class 5

			S_F	S_U	F_F	F_U
Kendall's tau_b	S_F	Correlation Coefficient	1.000			
		Sig. (2-tailed)	.			
		N	176			
	S_U	Correlation Coefficient	.484**	1.000		
		Sig. (2-tailed)	0.000	.		
		N	172	172		
	F_F	Correlation Coefficient	.	.	.	
		Sig. (2-tailed)	.	.	.	
		N	176	172	176	
	F_U	Correlation Coefficient	0.082	0.057	.	1.000
		Sig. (2-tailed)	0.235	0.434	.	.
		N	176	172	176	176

**. Correlation is significant at the 0.01 level (2-tailed).

Table 14 on the following page contains the results from the Tau analysis for Class 6, which contained 100 pairs of data. The Tau for the faculty usefulness variable could not be calculated with the other variables from this class due to insufficient data. Student perception of frequency and student perception of usefulness were positively correlated at the .01 level (τ = .359). Also, student frequency and faculty frequency variables were found to have a slightly less significant, and negative correlation with one another (τ = -.204, p = .05).

Table 14

Kendall's τ for Data from Class 6

			S_F	S_U	F_F	F_U
Kendall's tau_b		Correlation Coefficient	1.000			
	S_F	Sig. (2-tailed)	.			
		N	100			
		Correlation Coefficient	.359**	1.000		
	S_U	Sig. (2-tailed)	0.000	.		
		N	100	100		
		Correlation Coefficient	-.204*	-0.024	1.000	
	F_F	Sig. (2-tailed)	0.028	0.808	.	
		N	100	100	100	
		Correlation Coefficient	.	.	.	.
	F_U	Sig. (2-tailed)	.	.	.	.
		N	100	100	100	100

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

Table 15 on the following page contains the results from the Tau analysis for Class 7. While the Tau was able to be calculated for each of the variables in this class, the pairs of data were limited to 39. Analysis showed no statistically significant relationships between student variables and faculty variables in this class. Faculty frequency and usefulness variables were negatively correlated at the .05 level (τ = -.333), indicating that this faculty member perceived the technologies that were used less frequently to be more useful.

Table 15

Kendall's τ for Data from Class 7

			S_F	S_U	F_F	F_U
Kendall's tau_b		Correlation Coefficient	1.000			
	S_F	Sig. (2-tailed)	.			
		N	39			
		Correlation Coefficient	0.203	1.000		
	S_U	Sig. (2-tailed)	0.149	.		
		N	37	37		
		Correlation Coefficient	0.136	0.078	1.000	
	F_F	Sig. (2-tailed)	0.321	0.592	.	
		N	39	37	39	
		Correlation Coefficient	0.194	0.209	-.333*	1.000
	F_U	Sig. (2-tailed)	0.157	0.154	0.021	.
		N	39	37	39	39

*. Correlation is significant at the 0.05 level (2-tailed).

Table 16 below contains the results from the Tau analysis for Class 8. There were not sufficient data from Class 8 to calculate Kendall's Tau for the faculty variables, so only one measure of

Table 16

Kendall's τ for Data from Class 8

			S_F	S_U	F_F	F_U
Kendall's tau_b		Correlation Coefficient	1.000			
	S_F	Sig. (2-tailed)	.			
		N	183			
		Correlation Coefficient	.372**	1.000		
	S_U	Sig. (2-tailed)	0.000	.		
		N	172	172		
		Correlation Coefficient	.	.	.	
	F_F	Sig. (2-tailed)	.	.	.	
		N	183	172	183	
		Correlation Coefficient	.	.	.	.
	F_U	Sig. (2-tailed)	.	.	.	.
		N	183	172	183	183

**. Correlation is significant at the 0.01 level (2-tailed).

correlation was available from this class. Student perception of frequency was found to be positively correlated with perception of usefulness ($\tau = .372$, $p = .01$) in this class.

Table 17 below contains the results from the Tau analysis for Class 9. There were a total of 25 pairs of data in this class. The data were not sufficient to calculate the tau for either of the

Table 17

Kendall's τ for Data from Class 9

			S_F	S_U	F_F	F_U
Kendall's tau_b		Correlation Coefficient	1.000			
	S_F	Sig. (2-tailed)	.			
		N	25			
		Correlation Coefficient	.405*	1.000		
	S_U	Sig. (2-tailed)	0.041	.		
		N	25	25		
		Correlation Coefficient	.	.	.	
	F_F	Sig. (2-tailed)	.	.	.	
		N	25	25	25	
		Correlation Coefficient	.	.	.	.
	F_U	Sig. (2-tailed)	.	.	.	.
		N	25	25	25	25

*. Correlation is significant at the 0.05 level (2-tailed).

faculty variables. A significant relationship between student perception of frequency and student perception of usefulness ($\tau = .405$) was found to exist at the .05 level of significance. In the absence of sufficient data to support faculty variables, no other correlations could be calculated.

The Kendall's Tau analysis of the data when grouped by class did not reveal any relationships that were in contrast with the analysis of the same data when analyzed as a whole. The student survey data for perceived frequency of use and perceived usefulness were also grouped by specific technology for analysis using Kendall's Tau. Analysis using this grouping of the data allowed for a technology-by-technology analysis of the data across the classes that

participated in the study. By looking at these correlations in different groupings, a multidimensional picture of the data was developed.

Table 18 below contains the Tau analysis for the four classes which reported the use of the Internet in the classroom. This use includes any situation where the instructor used the Internet as part of their lecture, where the instructor controlled the experience and the students

Table 18

Kendall's τ for Data Related to Internet Use

			S_F	S_U	F_F	F_U
Kendall's tau_b		Correlation Coefficient	1.000			
	S_F	Sig. (2-tailed)	.			
		N	168			
		Correlation Coefficient	.355**	1.000		
	S_U	Sig. (2-tailed)	0.000	.		
		N	161	161		
		Correlation Coefficient	-.244**	-.175*	1.000	
	F_F	Sig. (2-tailed)	0.000	0.019	.	
		N	168	161	168	
		Correlation Coefficient	.	.	.	.
	F_U	Sig. (2-tailed)	.	.	.	.
		N	168	161	168	168

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

participated in a more passive manner. Student perception of the frequency of use of the Internet and student perceptions of the usefulness of the Internet as a learning tool in these four classes were positively correlated (τ = .355) at the .01 level. Both the student frequency (τ = -.244) and the student usefulness (τ = -.175) variables were negatively correlated with the faculty frequency variable, at the .01 and .05 levels, respectively. The negative correlation between the two

frequency variables suggests that for this technology there is a difference in how students and instructors define the parameters of the tool, or in how they relate to its use.

The use of Powerpoint is analyzed across classes in Table 19. Four classes of the nine in the study used Powerpoint as a lecture aid, resulting in 128 pairs of data. The tau for this technology shows significant positive correlations between each of the four variables in the table, including a 1:1 relationship between the faculty frequency variable and the faculty usefulness variable. Each of the relationships in this table is significant at the .01 level. This data suggests that both students and instructors perceive Powerpoint to be more useful they perceive it being used more frequently. Additionally, students in classes where Powerpoint was rated as being highly useful by the instructor tended to rate the technology as being more useful.

Table 19

Kendall's τ for Data Related to Powerpoint Use

			S_F	S_U	F_F	F_U
Kendall's tau_b		Correlation Coefficient	1.000			
	S_F	Sig. (2-tailed)	.			
		N	128			
		Correlation Coefficient	.469**	1.000		
	S_U	Sig. (2-tailed)	0.000	.		
		N	126	126		
		Correlation Coefficient	.638**	.368**	1.000	
	F_F	Sig. (2-tailed)	0.000	0.000	.	
		N	128	126	128	
		Correlation Coefficient	.638**	.368**	1.000**	1.000
	F_U	Sig. (2-tailed)	0.000	0.000	.	.
		N	128	126	128	128

**. Correlation is significant at the 0.01 level (2-tailed).

Video was the most frequently-used technology in the study, by class. Of the nine classes that participated in the study, the instructors of seven courses reported its use. While video can

be used in a variety of ways, the instructors in this study all reported using video as a lecture aid, shown to the entire class simultaneously as part of their lecture. As can be seen in Table 20 below, the frequency and usefulness variables were positively correlated in both the faculty and student groups, with significance at the .01 level. The faculty frequency variable was also found to be positively related to both the student frequency and the student usefulness variables. A positive, but not statistically significant relationship also existed between the faculty usefulness variable and the two student variables.

Table 20

Kendall's τ for Data Related to Video Use

			S_F	S_U	F_F	F_U
Kendall's tau_b	S_F	Correlation Coefficient	1.000			
		Sig. (2-tailed)	.			
		N	209			
	S_U	Correlation Coefficient	.299**	1.000		
		Sig. (2-tailed)	0.000	.		
		N	200	200		
	F_F	Correlation Coefficient	.166**	.183**	1.000	
		Sig. (2-tailed)	0.004	0.003	.	
		N	209	200	209	
	F_U	Correlation Coefficient	0.039	0.100	.609**	1.000
		Sig. (2-tailed)	0.529	0.130	0.000	.
		N	209	200	209	209

**. Correlation is significant at the 0.01 level (2-tailed).

The Tau analysis of the student and faculty perceptions of the use of a Class Web Site are found on the following page in Table 21. Student perception of frequency of use showed a significant positive relationship with student perception of usefulness ($\tau = .556$, $p = .01$). Faculty and student perceptions of frequency of use also showed a significant positive relationship ($\tau = .320$) at the .01 level. For this technology, the faculty members' perceptions of

usefulness were negatively correlated with each of the other three variables at the .01 level. This indicates that faculty participants and student participants who rated a class web site as being used more frequently also tended to rate the class web site as being less useful. Compared to the other types of technology, as well as the analysis of the data across all technology types, this is an unusual relationship. Further investigation of this relationship was done in the analysis of the body of qualitative data from cycles two and four of this study, but no explanation was evident.

Table 21

Kendall's τ for Data Related to Class Web Site Use

			S_F	S_U	F_F	F_U
Kendall's tau_b		Correlation Coefficient	1.000			
	S_F	Sig. (2-tailed)	.			
		N	221			
		Correlation Coefficient	.556**	1.000		
	S_U	Sig. (2-tailed)	0.000	.		
		N	189	189		
		Correlation Coefficient	.320**	0.099	1.000	
	F_F	Sig. (2-tailed)	0.000	0.141	.	
		N	221	189	221	
		Correlation Coefficient	-.301**	-.214**	-.377**	1.000
	F_U	Sig. (2-tailed)	0.000	0.001	0.000	.
		N	221	189	221	221

**. Correlation is significant at the 0.01 level (2-tailed).

The analysis of the relationship between faculty perceptions and student perceptions of both frequency of technology use and usefulness of technology in their classes using Kendall's Tau revealed some relationships between these variables. This held true in the majority of groupings, as the analysis showed relationships between these variables across classes when grouped by technology, as well as across technologies when grouped by class. When analyzed as a single group, the analysis also showed significant relationships between each of the variables.

While the nature of these relationships was not revealed by the Tau analysis of the quantitative data, the qualitative data from the survey, and that gained from the student and faculty interviews allowed for more in-depth analysis of these relationships.

The first subordinate research question in this study addressed the potential relationship between student age and student perception of the usefulness of technology. This research question was informed by the writings and research of those mentioned in the review of the literature who discussed technology use and perceptions of technology within a generation, or age-based framework. According to their writing, students often perceived technology to be less useful due to a mismatch between how they use technology and how their instructors use technology in the classroom context. For this study to align with this line of thinking, one would expect an inverse relationship between the teachers' and students' perceptions of usefulness. The first analysis of the quantitative survey data from students and faculty members did not support this conclusion. Another measure that has a connection to this difference of perception between age groups is the relationship between student age and student perceptions of technology's usefulness. Table 22 on the following page contains the results for the Tau analysis for the student age variable as it related to both the students' perception of frequency of use and the students' perception of usefulness. This analysis did not find a relationship, regular or inverse, between age and either of the two dependent variables. This result suggested that age may not be related to the perception of technology as a useful tool in classes at this college, and may not be related to students' perceptions of how frequently technology was used.

Table 22

Kendall's τ for Student Age with Frequency and Usefulness Data

	Frequency	Usefulness
Correlation Coefficient	-0.012	0.000
Sig. (2-tailed)	0.693	0.998
N	709	709

The second subordinate research question examined student perceptions of the usefulness of specific technologies. This question was addressed by examining the quantitative data from the student survey related to technology usefulness. Table 23 below summarizes the student responses to the questions regarding their perception of each technology's usefulness. Cases where the student reported a 'did not use' for each technology were excluded from this calculation, regardless of whether they responded to the usefulness question for that particular technology.

Table 23

Student Perceptions of Technology's Usefulness

Technology	Mean Usefulness	StDev	n
Powerpoint	4.51	0.91	258
Internet	4.25	1.11	258
Class Web Site	4.10	1.21	243
Video	4.06	1.20	262
Online Quizzes	3.49	1.51	128
Audio	3.36	1.53	184
Document Camera	3.00	1.47	126
Online Discussion	2.59	1.40	144

As is indicated by the data in Table 23, there were differences in the perception of usefulness for the different technologies. The top four technologies, in terms of student

perception of usefulness, were Powerpoint, in-class Internet use, a class web site, and in-class video. Each of these figures reported an *n* of over 243, and a standard deviation of less than 1.21. Assuming a normal distribution of the student responses, this means that 68.2% of the responses would have been 3 or greater for these four technologies.

Cycle four - student interviews. The first typology in the analysis of the student interview data was related to the students' relationship to technology, including their ownership of computers and other technology devices, as well as their experience using technology. Within this typology, a few themes emerged. First, a theme that was universal to all off the students who were interviewed was that of strong student computer ownership. Each of the 18 student participants owned a computer, and many of them indicated ownership of multiple computers, such as a laptop and a desktop computer. Fifteen of the students owned a laptop computer or both a laptop and desktop, while only three of the 18 students indicated that they owned only a desktop computer. Cell phone ownership and use was another universal technology factor, with many students indicating cell phone use for tasks other than voice calls, including internet, email and text messaging. Students indicated a heavy use of text messaging on their phones, with some students reporting the transmission over one hundred messages each day. One student reported sending "almost 300" text messages per day. Portable digital music players, including specific references to iPods, were also common among students in the interviews.

The second theme that emerged within this first typology was that of expertise or experience with computer and technology use. While there was variance in the ages of the interview participants, each participant reported that they had been exposed to computers and technology for a number of years. The younger participants frequently expressed a feeling that

they had been using technology for as long as they could remember, or that they had "grown up" using technology, often stating an age or a primary grade, as in "... since first grade". The participants in the group who belonged to the older generation tended to feel that they had been using computers for a long time as well, but associated their use with the emergence of the technology itself. This feeling was illustrated by the following quote, which was given in response to the question "How long have you been using computers?": "... since they came out." Only two of the 18 interview participants indicated that they had not been using computers for very long. Both of these participants stated that they had begun using computers when they began college. As these two students were 18 and 21 years of age, it could not be determined if age or generational membership was a factor in their more recent adoption of technology. In relation to the ideas in the literature which indicated a difference in the technology use between generations, this data suggests that older generations may have their own significant "technology use" identity. While younger technology users seemed to have the feeling that they have grown up in a technology-rich environment as expressed in Prensky (2001a, 2001b), Tapscott (1998) and others, those in older generations seemed to have a similar connection with technology. The older generation participants often indicated a feeling of watching current technology develop, or even participating in its development, "... since they came out. Messing and fooling around with them since they had the little Apple computers. I used to work with the old Cary – what's it called – word processor". The two students in the interview group who indicated non-use until college seemed to relate to technology in much the same way that Prensky describes the older-generation technology user. The interview data in this typology, when examined in the context of the quantitative data from faculty and students, seemed to indicate that one's feelings about

technology, as well as one's technology use may be more connected to the amount of exposure to and experience with technology rather than a person's age.

The second typology that was used for analysis of the interview data was directly related to the second subordinate research question. This question focused on the technologies that students perceived as being the most useful to their learning in class. Students were specifically asked to name the technologies that they felt were the most useful to them in their classes as well as why they believed that to be true. Table 24 below contains the number of student interview mentions of each of the four most frequently used technologies in the study.

Table 24

Student Interview Data Related to Most Useful Technologies

Technology	Number of mentions	% of student interviewee mentions
Powerpoint	9	50%
Video in Class	7	39%
Class Web Site	4	22%
Internet in Class	2	11%

The most prominently mentioned technology among the interview participants was Powerpoint. The common themes related to Powerpoint were ease of note taking, better organization and pacing of the lecture, and enhanced memory of the material. There were many comments like, "I really like when the teachers use Power Point. I find that really useful 'cause they can control everything with speed and everything. They can add their own explanations and stuff". These themes related to many of the comments on Powerpoint use that were given by the faculty participants in the study. The similarity of the student and faculty comments related to this specific technology indicate that the faculty goals for using this particular technology in their classes were being met, according to the feedback given by students. There were a few more

critical comments related to Powerpoint use given by student participants, although they were more general in scope and did not relate directly to the class in which they answered the survey. One student stated that Powerpoint could be used as a crutch by faculty members who don't spend adequate time in preparation for class. The vast majority of comments related to the use of Powerpoint in class were positive, even in cases where the occasional poor use of the technology was acknowledged: "even if it's like a good Power Point versus a bad one – I think I would rather have the Power Point than not have one."

The third typology in the student interview data was the students' perceptions of their instructors' use of technology. This typology related to the primary research question, as well as the first subordinate research question, both of which had a relationship to differences in the perception of technology between the faculty and students. Within this typology the emergent themes focused on barriers to technology use, as well as reasons why technology use may not be useful for student learning. The overall technology perceptions of students were also a prevalent theme in this typology. The context for this analysis was the quantitative analysis of the data from cycle three of this study. A significant relationship was found to exist between student participants' perceptions of frequency and their perceptions of usefulness. Overall, the descriptive analysis of the quantitative data revealed that overall, students had very positive perceptions of technology use. These quantitative conclusions were strongly reflected in the student interview data. One quote that illustrated this trend in the interview data was given in response to a question directly asking a student to recount a time when technology had a negative effect on learning, "I couldn't say that I felt that it hurt. I've only seen it strengthen the topics. It helps get more across in a shorter period of time..." In response to the same question, another

student responded, “I think any technology is useful in learning.” Many of the responses to this same question shared a similar type of response. The prominent negative theme in this set of responses focused primarily on two factors; technology malfunctions, and lack of teacher training in the specific use of the classroom technology.

Instructor training was a prominent theme throughout the student interview data, in response to many of the questions. In particular, the question regarding specific barriers to technology use in the classroom elicited responses related to training and knowledge of how to use the technology, such as “Just lack of training, I would think,” and “there‘s a lot of professors that don’t know how to use that particular device.” Many of the student participants shared a perception that faculty desired to use the technology effectively, but a generational theme also was reflected in some responses. This generational theme often reflected the idea that faculty members did not use technology because they did not grow up with it, or that they learned without technology and therefore felt that students should do the same, “they kind of get the mentality that – you know – like – I learned this way so you guys should be able to learn this way too.” There was only one student who directly referred to generational differences in their interview, stating “I think it’s – uh – a generational thing. They grew up not using it. They’re not use to not using it. That’s why they use a board or speak to you.” The other references to age or generational differences were indirect. This was an interesting contrast to the data gathered from the faculty participants, which did not reference generational or age-based differences as being an issue in the usefulness of technology. The other theme that was raised in the context of barriers to technology was also present in some of the faculty data. This theme was concern for the lack of available resources to purchase sufficient technology for use in the

classroom. This theme included acknowledgement of the cost of technology, as well as some discussion of the lack of funding available to education.

Summary of cycle four. The student interview data provided more information regarding the student responses to the quantitative items in the survey. In accordance with the triangulation designed outlined in Creswell and Clark (2007), this data helped to provide a more complete picture of the relative perceptions of technology use between students and faculty.

Overall, students in this study showed a positive perception of the usefulness of technology. They indicated that they would like to see more technology use in their classes, and in the context of their quantitative responses, they indicated that technologies that were used with a higher frequency were also perceived as being more useful for learning. Technologies that students found to be particularly useful were Powerpoint, video, and the Internet. These data are aligned with the quantitative data from both students and faculty surveys.

Students perceived their instructors to be willing in most cases to use technology, and also able to learn technology. There was a strong perception that lack of training and access to training was a barrier to the use of technology by instructors, and that access to technology itself was a barrier. Other less prominent barriers included technology malfunctions, and generational differences in experience with technology. Of these, only the generational barrier was not present in the faculty responses to a similar line of questioning. All of the other barriers mentioned by students in the interview portion of the study were also present in the faculty responses to the survey and interview questions. This suggests a high degree of agreement between faculty and student perceptions of the various barriers that exist to technology use.

Chapter Four Summary

In cycle one of this study, 43 faculty members responded to online surveys which requested information on faculty perceptions of the frequency and usefulness of their own technology use in the classroom. The surveys also asked faculty to respond in a qualitative manner to questions regarding their goals for the use of technology. The survey was used in part as a basis for comparing the responses of faculty participants with the responses given in the student survey in cycle three of the study. This data also yielded data about faculty technology use, as well as how faculty approach the use of technology.

The most prominent result from the cycle one data indicated that faculty members have a generally high perception of the usefulness of technology. The data also indicated that faculty technology use is centered around a fairly small number of different technologies, and that the ones used with the most frequency tend to be presentation-oriented, with faculty members in the active role using the technology with students as more passive observers. These technologies were identified in the study as video, Powerpoint, Internet use in class, and the use of a class web site. The qualitative survey data revealed that faculty members used technology for reasons that fell into one or more of three typologies: the use of technology as part of a specific teaching strategy, the response to a specific theory of learning (such as Multiple Intelligences), and practical information sharing. This data was useful for beginning to understand the instructional approaches to the use of technology.

In cycle two, nine faculty volunteers were chosen from the survey respondents in cycle one, and interviewed using a semi-structured interview protocol. This interview method allowed for some standardization of the set of questions, while still allowing the researcher the ability to

gather additional information about areas of interest that came up during the interview. Each interview was recorded using a digital device, and then transcribed for analysis. Once again, the typological method was used in the analysis of the interview data. The interviews produced data on why and how the participants used technology, their own personal experiences with technology, as well as their perception of their own students' use of technology.

The cycle two interviews produced data that was complimentary to the data from cycle one. Typological analysis revealed a profile of the average college professor from this study. This profile depicts a relatively experienced instructor, who uses technology in and out of school, but for what are generally a narrow set of uses. They are self-taught, and while they believe that training is important they don't often avail themselves of the technology training offered through the college. They see their students as having a high level of access to technology, but a lower ability to use the technology in meaningful ways. Data from cycle one was also used in the analysis of the interview data, as it offered additional information about the beliefs and perceptions of the faculty related to technology.

In cycle three, a survey was distributed to one class in each of the cycle two participants' schedules. A total of nine classes were surveyed. The administration of each survey was done during regularly scheduled class time, by the primary researcher, using a paper-based survey. The survey asked the students to respond to similar questions to the faulty survey, except that the technologies were pre-determined for the students using data from the first two cycles and input from the panel of experts.

The findings from this survey included frequency of use and usefulness perceptions for each technology, as well as the respondents' age and gender. The surveys were also marked with

which class they came from, so that they could later be studied by class. In addition, students were invited to make suggestions for which technologies they would like to see used more often and how technology could be used more effectively in their classes. The survey data revealed a generally high perception of all technologies in the study, in both the frequency of use and the usefulness variables. Analysis of the data showed that on the larger level, there was a relationship between frequency perception between faculty and students, and also a relationship between frequency and usefulness in both groups. However, there was no relationship between student perception of usefulness and faculty members' perception of usefulness. Analysis of the data grouped by technology and by class revealed some slight variance from this pattern, but not in a manner strong enough to warrant further study. Analysis of the data for usefulness as it was related to age also showed no significant correlation. The analysis of usefulness data on a technology-by-technology basis revealed that while overall students found all technology to be at least moderately useful, they strongly preferred video, powerpoint, internet use, and the use of a class web site. These four top-rated technologies had significantly higher scores than the rest of the technologies in the student survey.

In cycle four, two students from each class were contacted for an in-person interview, after volunteering to be interviewed in a designated space on the student survey. These interviews were semi-structured in format, and they were recorded and subsequently transcribed for analysis. Typological analysis was employed for the analysis of the interview data, and also drew upon the data from previous cycles as it informed the process as a whole.

The cycle four data helped to create a profile of a student technology user that was representative of those students who participated in the study. These students tended to be heavy

users of mobile technology, with high levels of cell phone use. They tended to own at least one computer, which for most is a laptop of both a laptop and a desktop computer. Their computer use was somewhat shallow and narrow, including school work, basic web usage, email and gaming. A few of the students indicated deeper usage, including the creation of computer games and the construction of the hardware itself, but these students represented the minority. These students expressed feelings that technology was useful to them in learning, although they would like to see it used more often in more classes, and with more expertise on the part of their instructors. Students did indicate a belief that instructors needed more training in the use of technology, although they did not attribute their instructors' lack of knowledge to the difference in ages, but rather to a simple lack of training and support for instructional technology.

Chapter Five

Conclusions and Recommendations

Introduction

The primary objective of the study was to examine how community college students' perceptions of the usefulness of instructional technology in their general education courses align with their instructors' perceptions of the same technologies. This examination was completed through the use of a mixed-methods, triangulation research design as outlined in Creswell and Clark (2006). In this design, both quantitative and qualitative data are gathered and analyzed to address the research questions more thoroughly, utilizing the strengths of each data type to compensate for some of the weaknesses in the other. In this study, surveys and interviews were used to gather data from both faculty members and students from each of the faculty members classes. Quantitative data were analyzed using Kendall's Tau to examine relationships between specific variables in various groupings which were determined using the research questions of the study. Qualitative data were subjected to typological analysis using the research questions and the results of the quantitative analysis to define the typologies as outlined in Hatch (2002). The quantitative results were also taken into consideration during the qualitative analysis. The use of the quantitative data in the qualitative analysis provided an explicit structural connection between the two data types. In addition, the quantitative analysis was considered in the development of themes within each typology, as these data also revealed patterns in the participants' perceptions of technology.

This study was guided by, and responds to current literature, which states that there are significant differences in the way individuals of different generations relate to and use technology, and that these differences result in a diminished usefulness when technology is used in the classroom. While many of these claims were based on the comparison of adult teachers with children in K-12 environments (Prensky, 2001a), the current age of what is termed *The Net Generation* now enables the comparison of adult learners who are part of the Net Generation to their older-generation instructors in a higher education setting. If there is a generational effect on the perception of technology, then logically there would be significant differences in the perception of technology between these two groups, even in a higher education context.

Findings

The results of this study were discussed in Chapter 4 of this paper using the format of the study, which consisted of four cycles. This format allowed for discussion of the results of the study in the context in which the data was gathered. However, the triangulation design discussed by Creswell and Clark (2007) calls for connections to be made between quantitative and qualitative data in order to develop a complete, singular picture of a given research problem. Therefore, the research questions for the study were used as the structural basis for the discussion of the findings of this study, to allow for the blending of data from all four cycles of the study to address the specific research questions.

Primary Research Question

How did students' perceptions of instructional technology use compare with their instructors' perceptions of instructional technology use in the same classroom? The primary research question for this study addresses general differences in the relative perceptions of

students and instructors with regard to technology use in instruction. This question was addressed in the study by the comparison of quantitative data indicating both student and faculty perceptions of frequency of technology use and the usefulness of technology in their classes.

The results of the study indicated that when faculty perceived a particular technology to be used often in their class, the students in their class also perceived that technology to be used often. One may interpret this result to mean that there is a basic agreement between faculty and their students on what technologies are being used prominently in their classes, as well as what level of use constitutes *often* versus *not often*. Frequency of use is one area of perception that appeared throughout the literature regarding generational differences in technology use. In this body of literature, students were commonly cited as complaining that the frequency of technology use does not match their use of technology outside of the class environment, despite their instructors' attempts to use technology in ways that are useful. This complaint indicated a mismatch between students and faculty which is not supported by this study. The data on frequency of use in this study indicated that students and faculty shared a similar perspective on how frequently technology is being used in the classroom.

The perceived usefulness data were analyzed as a whole, and also in the same groupings as the frequency of use data. The analysis of all pairs of data as one group revealed no relationship between instructors' perceptions of technology's usefulness and students' perceptions of technology's usefulness. As with the frequency of use data, there were cases where the data, when grouped by class or specific technology, did not contain enough variance to calculate a correlation coefficient. No statistically significant relationship was found to exist between student and faculty perceptions of technology's usefulness. This lack of relationship was

reinforced by the analysis of the relationship between student and faculty perceptions of usefulness in the smaller groupings by technology and by class. In these smaller groupings, significant relationships did appear in some of the data sets, although there was no consistency in the trajectory of the resulting coefficient. The effect in the larger body of data appeared to be that of canceling each other out. Despite the lack of a specific relationship between student and faculty perceptions of usefulness, it should be noted that in general, both faculty members and students expressed a belief that technology was generally useful in the context of learning. In both faculty and student groups, there was a statistically significant, positive relationship between frequency of use and perceived usefulness. This indicated that both faculty and students tended to rate technologies as being more useful when they rated them as being more frequently used.

The qualitative data in this study were also relevant to the primary research question. A prominent theme within the qualitative data from both the surveys and the interviews was that both students and faculty have a desire to use more technology in their classes, and that they would like to see it used with more skill and a higher allocation of resources. Qualitative data from students were thematically aligned with quotes from the faculty which indicated a desire to learn to use or develop new technologies for use in their classes. Since faculty have an active role in determining technology use for their classes in comparison to students, their desire to include more technology or to try new technologies in their classes manifested itself differently than the students' desire to include more technology. Faculty participants discussed their desire to include more technology in their courses in terms of institutional support, better training, and access to the time and resources they needed, whereas students were more direct in stating that

they would like to see their instructors use more technology, or even use technology better. This difference between the active role that faculty played in choosing technology and the passive role that students took in using what is chosen dictated how the common preference for increased usage manifested itself in each of the two groups.

There was agreement between faculty and student data related to the general usefulness of technology, and both groups indicated a positive relationship between frequency perceptions and usefulness perceptions. While there was no significant relationship found between the faculty and student quantitative data on the perception of usefulness, the qualitative data indicated that both students and faculty believed that the technology used in their classes is useful. However, there were qualitative data from both faculty and students which revealed a belief among both groups that these generational differences exist, and that they are at least partially responsible for less than successful attempts to use technology. The existence of this belief was symptomatic of the "moral panic" mentioned in Bennett, Maton and Kervin (2008). One faculty member shared a belief related to a tendency to avoid the adoption of new technology, which was attributed to age:

> For faculty, it's like – we kind of get stuck in old ways. We actually don't progress – um – technology just advances and I see it myself. I'm turning into an old fart. Oh, an iPhone and I don't know if I want to do this and this all the time and I – I know I'll get there but I can – I can see it – I can see myself just getting to a point where – aw – this new technology – who needs the new stuff when my old fart stuff works. So I think that's actually – and I see it within some of my faculty as well. (faculty interview, December, 2009).

Another faculty member made a specific reference to differences in age or generational groups, stating "... you can almost draw a line – you know – if they're over thirty they're more likely to have struggles with the technology – just not know and not even know what to ask."

Student comments in the interviews also revealed some belief that age and generation are factors in the successful implementation of technology. Some students described the relationship in terms of being set in one's ways, "most of my professors are kind of on the older side. So they're – like – they're comfortable with what they've had all this time." Other students characterized their professors as unwilling to change: "Old – some – I think some – yeah – just like – oh, I don't want to deal with that or go online – I'll just give the papers to the students or – just work out of the book." One student even made an explicit connection to generational differences, stating "I think it's – uh – a generational thing. They grew up not using it."

In summary, the data indicated that instructors and their students did share some common views regarding technology's usefulness in the classroom. First, they both agreed that technology is useful in the general sense. Although their specific ideas regarding which technologies were the most useful and how useful they are did not relate in a consistent way, the qualitative data reinforced the idea that generally speaking, students and faculty would have liked to to have seen more technologies used, and in more useful ways.

Even though there was agreement between the two groups, members of both the faculty and student groups had a perception that generational, or age-related differences exist. Also interesting is that in discussing this perceived difference, members of each group consistently discussed the generational differences in the context of the other group as being the one that was different. The data, taken as a whole, did not support the literature that indicated differences

between generations in the perceived usefulness of technology. The relationship between student and faculty perceptions was best characterized as being in agreement that technology is useful, and that more technology should be used with better support and more training for faculty. However, there was not perfect agreement in terms of a one to one correlation of student and faculty ratings on a technology-by-technology basis. The more specific examination of data for usefulness between the two groups indicates that there was a likely disagreement between faculty and students regarding the usefulness of specific technologies. However, the lack of variance in the faculty data warrants further investigation with larger numbers of faculty participants before a conclusion is drawn.

Subordinate question one

Did students of different age groups differ in their perceptions of the usefulness of instructional technology? The analysis of the quantitative and qualitative data showed no significant relationship between age and perceived usefulness of technology. Table 20 in this study reports the findings of Kendall's Tau for age and perception of usefulness, which revealed no significant relationship between the two variables. The qualitative analysis in cycle four of the study did not identify any themes related to the age of the participants. Students of all ages, as well as faculty, had positive perceptions of technology's usefulness. While there was not perfect agreement between the two groups, the data indicated a general agreement between the two groups that technology is useful. In comparison to the writings on generational differences in technology, the expectation of the researcher was that a relationship of either direction would have been evident, as students' perceptions of usefulness are theoretically connected to their age (Prensky, 2001a). The absence of such a pattern in the quantitative data, together with the lack

of any such theme within the qualitative data suggested that the influence of age on the perception of technology was not as strong as the literature in this area suggests. The fact that the student participants in this study were all adults further suggests that the generational differences found in the writing of Prensky and Tapscott could have been the result of previous studies' comparison of adult teachers with students who were children. Another interpretation of this data is that as the younger generation ages into adulthood, the factors that appeared to make their generation unique are diminished, such that their perceptions shift to become more like the older adults in the preceding generations. This shift in the perception of the Net Generation could also have been met by an inverse shift in the way that older generations relate to technology. This shift in the older generations was also supported by the data in this study, which showed a positive perception of usefulness in both faculty and students who belong to older generations.

Subordinate Question Two

Did students perceive different types of technology to be more useful than others?

Students found some technologies to be more useful than others. Namely, students in this study preferred the use of Powerpoint, the Internet, a class web site, and video. Typological analysis of the qualitative data revealed strong themes in support of the use of specific technologies. Powerpoint was a prominent theme in student data, where many mentioned it in a general positive sense, such as "I tend to do better in classes that use Powerpoint," or "Power Point slides, of course – um – that helps me a lot ' cause it's much easier for me." Other students had more specific reasons for Powerpoint's usefulness, like "I find that (Powerpoint) really useful 'cause they can control everything with speed and everything. They can add their own

explanations and stuff." Video use in class was another prominent theme within the typology of technologies that were specifically mentioned. This theme was characterized by an almost universal use of the term "YouTube" to refer to video of all types, in the same way that the proper "Xerox" is used in reference to photocopies. One such quote was given in response to a researcher question regarding technology the student would like to see used more often in their classes: "...videos to convey messages – like U-Tube and stuff – and there's a lot of valuable videos on that to help you learn, especially in History." Although the Internet and the use of a web site specific to the class were ranked high among the technologies in the quantitative data set for usefulness, neither of these technologies emerged as a prominent theme within this typology. Likewise, there were no technologies that emerged as a theme which were not part of the ranked set of eight technologies. An occasional mention was made of mobile technologies, but only in the context of what students would like to see used in their version of the ideal or "dream" technology scenario. It should be noted that none of these technologies were mentioned in any of the faculty responses.

Theoretical Implications of the Study

The theories addressed by this study are based on the presumption that over time younger generations of students have emerged, and that because of their environment, exposure to technology, and other factors, they are substantially different in the ways that they relate to and use technology. Marc Prensky, in his many writings, has characterized the differences between the Net Generation and older generations as being as severe as the cultural differences of someone who is visiting a different country, with different languages and cultural norms. In Prensky's work, it is not the Net Generation who are the strangers in a foreign land, however. It

is the older generations who are referred to as Digital Immigrants (Prensky, 2001b), and the Net Generation who Prensky labels the Digital Natives, symbolic of their congruence with the 21st Century world. Critics of Prensky's work often focus more on the value laden nature of the Digital Immigrants label, and less on the nature of the differences between the generational groups. The aspect of Prensky's set of ideas that is the focus of this study is that in comparing Digital Natives and Digital Immigrants, Prensky compares children with adults. The comparison of children to adults introduces a number of factors which could complicate the isolation of generational differences. This study compares the perceptions of adult members of the Digital Natives, or the Net Generation, with members of older generations, both within the student population and between students and faculty members. There was no significant relationship found among the age of students and their perception of the usefulness of technologies in their classrooms. In the context of Prensky's ideas, the expected results of this study would be a positive relationship between age and student perceptions of classroom technology. In other words, students who were older would have a higher perception of classroom technology because they were closer in age to that of the instructor. Younger students would have a lower perception of technology's usefulness resulting from their generational differences. The data from this study do not directly support Prensky's ideas. However, it does not directly refute the idea that different generations relate to technology in different ways. Rather, the results of this study suggest that this is a complex issue, and that theories seeking to explain this issue should be sufficiently complex. The results of this study also suggest that both students in the Net Generation and older generations, as well as teachers who belong to older generations agree that technology is useful for learning, and that it should be used in significant amounts. This

agreement suggests that Prensky's position, or at least the practical implications of that position, do not apply to higher education settings.

The results of the analysis examining the relationship between the students' perception of usefulness and the faculty members' perception of usefulness also did not reveal a relationship. The lack of relationship between these two variables supports Prensky's (2001a, 2001b) position, indicating that a difference in perception existed between faculty and students. This is an important finding, not only because it supports existing theory, but also because it means that instructors may be investing their effort in technologies which they believed to be useful, but were believed by students to be less so.

This result would be of general concern, in the presence of two conditions: First, it would have to be found on a larger scale, in a study performed using a sample that was generalizable to the general population. Second, the concern with this lack of a correlation between student and faculty perceptions of technology's usefulness would be of concern if the overall range of these perceptions was less than positive. In this data set, student perceptions of technology in general were very high, and their perceptions when grouped by technology were very high as well. The qualitative data in the study supported a theoretical rift between generations in only one aspect. There were some faculty members, and some students who explicitly stated a belief that such a rift exists between older and younger generations. However, despite their statement that these differences exist, there was no other evidence to support such differences. Alternately stated, the fact that some students believe there are differences between generations does not mean that those differences are real. The results of this study more strongly support the proliferation of the concept of differences between generations than it does the

existence of such differences. This proliferation of the idea of generational differences embodies the explanation of moral panic as it is explained in Bennett, Maton, and Kervin (2008). More research is necessary in order to determine if there are generational differences between today's teachers and adults who are part of the Net Generation. Further, analysis of any differences found between adult learners and their older-generation instructors needs to be performed in order to determine their scope and level of significance in terms of their effects on learning.

Practical Implications and Recommendations

This study highlighted several practical implications, both for the instructors at Bakersfield College and for college instructors in general. The general conclusion of this study is that technology is believed to be useful, both to older students and younger students, and that faculty members who take the time to learn and implement technology are able to do so in a way that is relevant and satisfying to students, despite their age.

Technology is useful, and frequency of use is related to the degree of usefulness. This study shows a strong perception among faculty and students that technology is useful for learning, and that the more frequently a technology is used, the more useful it becomes. This relationship could be the result of a developing expertise on the part of faculty, students, or both with higher levels of use. It could be the result of a higher level of integration between the technology and the classroom or teaching environment. There could be other factors that come to bear on this relationship, but are yet undiscussed in the literature. However, the data from this study, both qualitative and quantitative, support a high level of technology use.

The implication of these findings is that teachers should use technology in their classes, and that they should do so in ways that place technology in a more ubiquitous role in their

instruction rather than using technology in narrow or limited capacities. Students' preferences for high levels of technology use in classes could be a simple reflection of their preferences for technology. However, it could also be an indicator that students benefit from having enough time and exposure to a classroom technology to allow them to become accustomed to its use. Students in the study indicated that there was some effort involved with learning to use technology in each class. This effort could perhaps produce a higher degree of benefit if technology is more consistently used within a single class, or even used in similar ways across classes.

Training, time, and resources are barriers to technology use. Both faculty and student participants specifically mentioned lack of knowledge and training as significant barriers to the good use of technology in the classroom. Faculty participants would benefit from having the time and support to develop their technology skills. Every faculty participant in the interview process mentioned a desire to learn more and expand their use of technology, but cited an insufficient amount of knowledge, time or resources to accomplish this goal. In many cases, the resources are available to faculty, but the faculty don't have the time or training to make use of them. To remedy this lack of time and training, institutions should develop training opportunities for faculty which take into account scheduling and availability of faculty members. Scheduled training opportunities should be held during times when more faculty are available between classes, on a variety of days of the week, and even during periods of time between terms or semesters. The availability of on-demand, or self-service training should also be considered as a way to address the difficulty faculty have in obtaining training for more effective technology use. Incentives or additional benefits for faculty participation in training opportunities may also

support increased participation. The expectations of both students and faculty in this study reinforce the importance of a strong institutional role in training and professional development.

The Net Generation uses technology, but may not understand it. Many of the writers who support the idea that major generational differences in technology use focus on data such as the number of teens who own a cell phone, the average number of hours spent playing video games or watching TV, or the number of text messages sent on a daily basis worldwide by members of the Net Generation. However, it should be pointed out that none of these activities requires more than a basic knowledge of which buttons to push in order to achieve a desired result. The Net Generation does use technology with a high frequency, but their use of these technologies appears to be relatively shallow in terms of the level of expertise required. It should also be noted that while the Net Generation used more technology than previous generations did at the equivalent age, a comparison of different generations as a cross section of today's society shows that this gap is closing. As such, the characterization of this generation as being exceptionally technologically savvy based on usage data may be misleading.

The data from this study, on the other hand, suggests that while students do use mobile devices such as cell phones, iPods, and smart phones with great frequency for communication and the sharing of knowledge, they report a lack of knowledge about how these devices work or the technology itself. In fact the Net Generation seems to excel in the use of technology in the specific area that may be characterized by the "end user" role they seem to play. The number of people in this generation who are truly savvy users, with knowledge of the technology and how it works, is still a minority of the population. This interpretation of the data from this study aligns with critics of the generational literature.

The significance of this, in terms of how instructors use technology in their classrooms, is that many students, despite having a computer, will not be familiar with how to change the margins to one inch when writing a term paper, how to publish something on the World Wide Web, or how to properly evaluate an Internet resource. Their level of knowledge may be limited to surfing the web, sending email, playing video games, and text messaging their friends. This not only means that students aren't technologically ready for a high level of technical participation in their courses, but also that teachers will have to be savvy enough to instruct their students on the proper use of any technology they use in instruction. In support of this possible interpretation of the technological profile of the Net Generation, one may refer to the data in this study, and the types of technology that were regarded by students as being the most useful. The top four most useful technologies, as rated by students in this study, were Powerpoint, video, Internet use (used by their instructor, demonstrated to the class), and a class web site where they could access information on the class. Note that each of these activities places the learner in a passive role. In most of these cases, with the possible though unlikely exception of the class web site, the student can benefit from the use of the technology despite their own level of technology expertise, as long as the instructor can use the technology effectively. This reinforces the possible existence of a Net Generation that uses technology frequently, but does not have significant technology knowledge.

Recommendations for Bakersfield College

The results of this study revealed that faculty and students perceive a relatively small set of technologies to be the most useful. Thus, Bakersfield College should focus resources in these areas which are perceived by faculty and students to be the most useful. In addition, as new

technologies are introduced for possible adoption, the college should be cautious in its approach and whenever possible use a data-driven approach to implementation.

Professional development for faculty members should be increased and should center around these same technologies. Support for these technologies should be emphasized, and classroom support should receive top priority. Additionally, technology systems in classrooms across campus should be simplified and standardized where possible to facilitate training and ease of use for instructors.

Based on the qualitative student data resulting from this study, the college should also consider the development of a set of best practices for technology use in the classroom, in order to enhance the student learning experience from one class to another. Doing so would allow for a more standardized technology experience across the classes at the college, which would capitalize on the relationship between student perception of frequency of use and student perception of usefulness found in the data.

Recommendations for Further Research

There is much work to be done in the area of this study. The primary recommendation for further study in this area is a broader study, involving a larger number of faculty and students, and using a survey tool that included both qualitative and quantitative items. Qualitative data will continue to be of importance in the study of the relationship between generations and technology use, as there are many variables to consider. Qualitative data enables researchers to obtain a more complete picture of a phenomenon than quantitative data alone. Quantitative items of interest in subsequent studies would include specific questions related to the amount of experience and frequency of use of a variety of technologies, as well as rating the usefulness of a

larger number of technologies. Additionally, the use of a scale with a higher number of data points would allow for a more accurate and specific analysis of the data.

Longitudinal studies would also be useful in this area, as they would allow students to be observed and tracked over a number of years as they learn, use, and relate to technology. Of course, in studies where the subject has both knowledge of the focus of the study and the ability to affect their own status with regard to that area of focus, there is a high risk of the outcome being affected by intentional participation by the subjects.

Conclusion

This area of study is important to pursue, not only because of the amount of money and resources that are assigned to the development and use of technology in classes in both higher education and in K-12 education, but also because if younger generations are truly different because of their exposure to technology, then educators need to understand this phenomenon so that they can adapt and maintain their own effectiveness. In this study, both quantitative and qualitative data were used to explore how students within the Net Generation relate to the technologies used by their instructors in the context of general education courses at Bakersfield College, with is a community college in central California. The findings of this study did not solidly reinforce the differences presented by much of the relevant literature in this area, nor did the data solidly support similarity between the two groups in how they view technology. However, the data gathered in this study did reinforce the use of technology in general, and the practice of resource allocation and professional development for faculty members. This study also prompts further discussion on the nature of technology expertise within the Net Generation as part of gaining a better understanding of how technology is best implemented in education.

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Appendices

Appendix A

Community College Faculty Technology Use Survey

Informed Consent

Thank you for your willingness to answer this survey, which focuses on your use of technology in the courses you teach. The information that you provide will be reported in a research study that will be available to other higher education institutions.

At the end of this questionnaire, you will be asked to indicate whether you would be willing participate in additional segments of this study. If you agree to further participation, then you would be asked to:

1. Participate in a short interview with Bill Moseley regarding your technology use.
2. Allow a short period of time in one of your classes to allow your students to be surveyed regarding their perceptions of the technology use in your class.

Your answers will be confidential, and neither your Bakersfield College, nor the University of Nebraska-Lincoln will be able to identify you. Your responses and the results of any student responses or survey participation will also be kept confidential, and will not be used in any manner related to your faculty evaluation or any other evaluation of your performance at Bakersfield College, or at any other institution.

We appreciate participation in this survey. If you have any questions or concerns, please contact the researcher or supervisor below:

Bill Moseley -- Phone: 661-395-4741 -- Email: bill@bmoseley.com
Ronald Joekel -- Phone: 402-472-0971 -- Email: rjoekel@unlnotes.unl.edu (Supervisor)

If you have any questions about your rights as a research participant or concerns about the study, you can contact the UNL IRB at 402-472-6965 or irb@unl.edu.

Instructions and consent

I give my consent to the following:

For this survey you were selected as part of the full-time faculty at Bakersfield College. We ask that you read this form and ask any questions you may have before agreeing to be in the study.

This study is being conducted by Bill Moseley, in partial fulfillment of his Ph.D. in Educational Leadership and Higher Education at the University of Nebraska-Lincoln.

If you are willing to participate in this study, please complete the following survey. The survey should take approximately 5-10 minutes to complete.

Risks and Benefits of Being in the Study

There are no known risks involved in participating in this study. The benefit of your participation is feedback on the perceived usefulness of your technology use, and the contribution to the body of knowledge in this area of study.

Confidentiality

Your responses to this study will be kept private and confidential, and in any published document that uses this data, participants will not be personally identifiable. Only the researchers in this study will have access to the research data and records.

Voluntary Nature of the Study

This study is completely voluntary, and the decision to participate or to abstain from participation is yours. This decision will not affect any relationships or standing with your institution or classes or anyone within that institution or your classes. If you choose to participate, then you may choose to abstain from responding to any of the questions in the survey that you do not wish to answer, for any reason.

Statement of Consent

I have read the above information and have had the opportunity to ask questions and receive answers. I consent to participate in the study.

☐ No
☐ Yes

You should print this page for your own records prior to continuing.

[Give Consent and Continue With Survey]

Community College Faculty Technology Use Survey

In the spaces below, please list the five technologies that you use most frequently in your classes. If you use fewer than five, please list the ones you do use.

Next to each technology you list, please select the number corresponding to the frequency with which you use that particular technology.

Examples of such technologies might include blogs, wikis, a class web site, online discussions, podcasts, videos, and powerpoint, although if you use something other than these please feel free to list it.

1. _____

2. _____

3. _____

4. _____

5. _____

For each of the five technologies that you mention at the top of this survey, please circle the number that corresponds to how useful you think this technology is in terms of helping students learn in your class.

1. _____	5	4	3	2	1
2. _____	5	4	3	2	1
3. _____	5	4	3	2	1
4. _____	5	4	3	2	1
5. _____	5	4	3	2	1

Select the three technologies above that you think are the most useful to students in terms of helping them learn in your classes. For each one, briefly state your goals for using that technology in your class.

1. _____
2.
3. _____
4.
5. _____
6.
7. _____
8.
9. _____
10.
11._____

If asked, would you be willing to provide additional data for this study?

☐ No
☐ Yes

If so, please provide the contact information below:

Name: _____

Email: _____

Phone: _____

Appendix B

Community College Faculty Member Interview Guide

Community College Faculty Member Interview Guide

Background Questions

What department do you teach in?
How many years have you taught full time at Bakersfield College?
What is your experience in learning about and using technology?
Do you use a computer outside of your work?

Essential Questions

What prompted you to use the technologies that you currently use in your class?
Did you receive any help or training in order to implement these technologies? If so, what?
In your opinion, what factors make a particular technology more useful to students than others?
Please describe a time when you felt like technology was particularly useful to the students in your class.
Please describe a time when you felt like technology was not useful to the students in your class.
What process do you use to select technologies for use in your class?
How do you make a connection between the use of a technology, and a specific instructional goal?
About what percentage of your current students do you think are fluent in technology?
About what percentage of your current students do you think has access to a computer at home?
Are there any technologies that you would like to start using in your class?
What are the barriers to technology use experienced by your colleagues?
What disadvantages do you see in using technology in your classes?

Instructor-specific Questions (personalized based on survey responses)

On your survey, you indicated that _____ was the most useful technology that you use in class. What makes you believe this? Please tell me more about how this technology is used in your class.

** Note that each of these questions is an open ended starting point. Additional, probing questions will be asked in order to gain additional information from participants according to the procedures for Formal interviews found in Hatch (2002).

Appendix C

Community College Student Technology Survey

Informed Consent

Thank you for your willingness to answer this survey, which focuses on your experiences with and opinions about your technology use, both in your personal life and in your school-related work. The information that you and other students at your college provide will be reported in a research study that will be available to other higher education institutions.

Your answers will be confidential, and your school, your instructor, and the University of Nebraska-Lincoln will not be able to identify you. We appreciate participation in this survey. If you have any questions or concerns, please contact the researcher or supervisor below:

Bill Moseley -- Phone: 661-395-4741 -- Email: bill@bmoseley.com
Ronald Joekel -- Phone: 402-472-0971 -- Email: rjoekel@unlnotes.unl.edu (Supervisor)

If you have any questions about your rights as a research participant or concerns about the study, you can contact the UNL IRB at 402-472-6965 or irb@unl.edu.

Instructions and consent

We may only survey students age 18 or older.

I am 18 years old or older, and give my consent to the following:

For this survey you were selected at random from a list of students at your institution. We ask that you read this form and ask any questions you may have before agreeing to be in the study.

This study is being conducted by Bill Moseley, in partial fulfillment of his Ph.D. in Educational Leadership and Higher Education at the University of Nebraska-Lincoln.

The survey asks for basic information on how you use technology, both in your personal life and related to schoolwork at this institution. It should take about 15 minutes to complete. Please answer each question to the best of your ability. There is no right or wrong answer.

Risks and Benefits of Being in the Study

There are no known risks involved in participating in this study. The benefit of your participation is to provide important information about technology use by community college students to leaders at your college, as well as other institutions.

Confidentiality

Your responses to this study will be kept private and confidential, and in any published document that uses this data, participants will not be personally identifiable. Only the researchers in this study will have access to the research data and records.

Voluntary Nature of the Study

This study is completely voluntary, and the decision to participate or to abstain from participation is yours. This decision will not affect any relationships or standing with your institution or classes or anyone within that institution or your classes. If you choose to participate, then you may choose to abstain from responding to any of the questions in the survey that you do not wish to answer, for any reason.

**** Please keep this page for your own records, or if you have any questions**

Statement of Consent

1. I have read the above information and have had the opportunity to ask questions and receive answers. I consent to participate in the study.

☐ No ☐ Yes

Signature: _____ Date: _____

Community College Student Technology Survey

Personal Information

2. Your age: ____ 3. Your Gender (circle one): Male Female

(You must be at least 18 years old to participate in this study. If you are not 18, please do not continue)

Questionaire

Please answer each of the following questions as they relate to the technology use in this class.

For each of the technologies listed below, please circle the number that represents how often that technology is used in this class.

4. Powerpoint

5. Video

6. Recorded Audio / Podcasts

7. Online Discussion Forums

8. Class Web Site

9. _____

10. _____

11. _____

Below is the same list of technologies that you responded to above. For each, please circle the number that represents how useful that technology is to your learning in this class.

12. Powerpoint

13. Video

14. Recorded Audio / Podcasts

15. Online Discussion Forums

16. Class Web Site

17. _____

18. _____

19. _____

20. What technologies would you like to use in your class that aren't currently used?

_____

_____

21. What do you think would make technology more useful to you in your class?

_____

_____

22. If you would be willing to participate in a short interview regarding your responses to this survey, please write your name/email address/ phone number below:

N: _____ E: _____ P:_____

Appendix D

Community College Student Interview Guide

Community College Student Interview Guide

Background Questions

- Tell me a little bit about yourself, and schooling here at BC - for example, how many classes have you taken, what's your major, etc?
- Do you own a computer? What kind?
- How long have you been using computers?
- What other technology devices do you use on a regular basis?
- What do you use technology for in your everyday life?
- How would you describe your feelings about technology?

Essential Questions

- What are some of the ways that you use technology in your coursework here at BC?
- What courses have you used technology in here at BC, and how frequently have you used it?
- How frequently do instructors in classes you have taken this semester, use technology as an instructional tool? (how many hours or how many class periods, etc.)
- Please describe a time when you felt that technology was really useful in helping you learn.
- Please describe a time when you felt that technology was a part of your coursework, but wasn't very useful.
- What technologies do you find the most useful for you as a student, and why?
- What technologies do you find least useful in your learning?
- How would you describe your own expertise with technology?
- What are some similarities between how you use technology for your coursework and how you would choose to use technology in you every day life?
- What are some differences between how you use technology for your coursework and how you would choose to use technology in you every day life?
- Describe what a college course would look like if the instructor was using just the right amount of technology for you.
- In your experiences, what barriers exist for technology to be more useful in college courses in courses you are taking?
- What do you think technology in college courses will be like in the future.
- Are there problems with technology in classes you have taken that interfered with learning? (if they say yes, follow up with questions of what were they,etc.?)

Class Specific Questions (questions will be personalized based on survey data)

- Your instructor indicates that they use _____ in the class. How useful do you believe this is, and why?
- Your instructor says that their goal for using technology in the class is _____ . Do you think that their use of technology accomplishes this goal? Why / why not?
-

** Note that each of these questions is an open ended starting point. Additional, probing questions will be asked in order to gain additional information from participants according to the procedures for Formal interviews found in Hatch (2002).

Appendix E

Attestation from External Auditor

External Audit Attestation
by Paul Sparks, Ph.D.
Pepperdine University
Faculty Member, Graduate School of Education and Psychology

William Moseley asked me to perform an audit of his mixed methods design dissertation study, entitled "Student and Faculty Perceptions of Technology's Usefulness in Community College General Education Courses", to determine the extent to which the study methods and interpretation of the data are trustworthy.

As part of this audit, I had the opportunity to review the following:

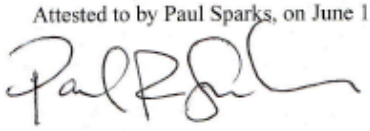
- The completed research paper
- The original audio recordings of the interviews for the study
- The verbatim transcripts of the interviews
- Digital scanned copies of a sample of the student and faculty survey instruments
- The quantitative data in tabular form
- The qualitative data and codes used in the interpretation of the data

In addition to the review of the data and research instruments, William and I discussed his methods and interpretations at length, including the process by which the qualitative data were analyzed using typological methods as described in the paper.

After reviewing the materials above, and the research paper, I can submit the following conclusions:

1. The methods and focus of the study were aligned with the stated research questions.
2. The methodology used was consistent with the proposed methodology in Chapter three of the dissertation.
3. The data collection and analysis procedures were consistent with those described in chapter three of the dissertation.
4. This study was found to be organized, and carefully implemented. The data was analyzed in a manner consistent with the proposal, and with relevance to the research questions.
5. Therefore, the conclusion of this auditor is that this study is trustworthy.

Attested to by Paul Sparks, on June 17, 2010.



Paul Sparks, Ph.D.
Faculty Member, Graduate School of Education and Psychology
Pepperdine University
Los Angeles, CA

Appendix F

IRB Approval Letter

University of Nebraska Lincoln

October 14, 2009

William Moseley
Department of Educational Administration

Ronald Joekel
Department of Educational Administration
124 TEAC UNL 68588-0360

IRB Number: 20091010213 EX
Project ID: 10213
Project Title: Perceptions of Instructional Technology Usefulness in Community College General Education Courses

Dear William:

This letter is to officially notify you of the approval of your project by the Institutional Review Board (IRB) for the Protection of Human Subjects. It is the Board's opinion that you have provided adequate safeguards for the rights and welfare of the participants in this study based on the information provided. Your proposal is in compliance with this institution's Federal Wide Assurance 00002258 and the DHHS Regulations for the Protection of Human Subjects (45 CFR 46) and has been classified as exempt.

You are authorized to implement this study as of the Date of Final Approval: 10/14/2009. This approval is Valid Until: 03/01/2010.

1. The approved informed consent form has been uploaded to NUgrant (file with -Approved.pdf in the file name). Please use this form to distribute to participants. If you need to make changes to the informed consent form, please submit the revised form to the IRB for review and approval prior to using it. Also, please include the IRB approval number on the on-line informed consent form.

We wish to remind you that the principal investigator is responsible for reporting to this Board any of the following events within 48 hours of the event:
• Any serious event (including on-site and off-site adverse events, injuries, side effects, deaths, or other problems) which in the opinion of the local investigator was unanticipated, involved risk to subjects or others, and was possibly related to the research procedures;
• Any serious accidental or unintentional change to the IRB-approved protocol that involves risk or has the potential to recur;
• Any publication in the literature, safety monitoring report, interim result or other finding that indicates an unexpected change to the risk/benefit ratio of the research;

• Any breach in confidentiality or compromise in data privacy related to the subject or others; or
• Any complaint of a subject that indicates an unanticipated risk or that cannot be resolved by the research staff.

This project should be conducted in full accordance with all applicable sections of the IRB Guidelines and you should notify the IRB immediately of any proposed changes that may affect the exempt status of your research project. You should report any unanticipated problems involving risks to the participants or others to the Board.

If you have any questions, please contact the IRB office at 472-6965.

Sincerely,

Mario Scalora, Ph.D.
Chair for the IRB