2007 AERA Annual Meeting

University Students' Perceptions of Computer Technology Experiences

Yukiko Inoue, PhD
Professor of Educational Research

Mailing address:
University of Guam (School of Education)
UOG Station, Mnagilao, Guam 96923 USA
Phone: 1-671-735-2413
Fax: 1-671-734-3651
E-mail: yukiinoue2005@yahoo.com

Paper presented at the AERA Annual Meeting, April 9-13, 2007, Chicago

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Yukiko Inoue, University of Guam

In today's knowledge age, university administrators and educators have been committed to finding ways to make learning more meaningful, more transferable to various situations out of a specific context, and more conducive to self-directed, lifelong learning (Lim, 2004). There is no question that information and communications technology (ICT)—which is characterized as "service" and "product" specifically designed to organize and to speed up the flow of information—is a valuable, useful resource and tool for learning and teaching (Kompf, 2005). The following three intriguing and constructive inquiries posed by Roldan and Wu (2004) are the special interest of the research study reported in the present paper:

1. Are today's college students well prepared for the challenges of the information age?
2. Do students possess the skills and motivation required for self-directed, lifelong learning?
3. How can educators help students to better prepare and improve information literacy skills?

Guided by these inquiries, and at the same time on the basis of a survey as a research method, the author examined students' perceptions of computer technology experiences. A survey was administered to students enrolled in education courses at a comprehensive university in the western Pacific. A Likert scale instrument was developed to collect student data that were analyzed using an analysis of variance (ANOVA). Qualitative data (students' one-page essays on the use of technology and self-directed learning) were also utilized to support quantitative data.

Technology in Higher Education

Technology is intended to serve human purposes, and the burden of technology use is that people must choose carefully *how* to apply it so that they do not sacrifice individuality (Agre, 1999). The integration of technology into education systems is forcing colleges and universities to make dramatic changes, increasing the *quality*, *diversity*, and *availability* of information, and altering the teacher-student relationship; technology should be used to leverage the existing knowledge base, to enrich, expand, and extend the curriculum from educators' perspective, and to engage interest for investigation and in-depth understanding from students' perspective (Moore, 1999). Technology in education is a necessity for up-to-date learning and teaching, but it is argued that it should be used as part of education, not as a viable substitute (Kompf, 2005).

Delamarter (2005) recognizes four reasons why teachers and professors need to get more involved with technology:

1. to meet student expectations;
2. to enrich the classroom experience by engaging the visual learners;
3. to enhance the traditional course through richer pedagogical strategies available with technology; and
4. to offer online distance programs.

Professors therefore need to get themselves trained with information technology as well as to get themselves into a position to discuss intelligently what sorts of scenarios and policies are the best practice that can be sustained to produce quality teaching and learning (Delamarter, 2005).

Many researchers have made empirical attempts to investigate, explore, expand, or evaluate the integration of technology into education and learning. Eynon's (2005) study has found that

the most common faculty use of ICT in all subjects is to provide students with access to a range of online resources. It has also showed that faculty motivations for using ICT are to enhance the educational experience for students and to compensate for some of the changes occurring in higher education (such as the rise in student numbers, and demand for flexible learning opportunities). According to Metzger, Flanagin, and Zwarun's (2003) report, college students rely very heavily on the Web for both general and academic information and they expect this usage to increase over time. The report has further stated that college students tend to believe information from the Internet more fully than do people from a more general adult population.

Sheard and Lynch's (2003) study on learner diversity has indicated that different students do experience and react to an online environment in different ways depending on their previous experience and that no one format is going to meet the needs of all students. Therefore, constant challenges for online learning are students' familiarity with the learning environment and their skills and confidence with the Internet and information technology. Van Soest, Canon, and Grant (2000) strongly suggest that using a Web forum can encourage dialogue among students as well as between students and the professor and thus can enhance learning within a safe environment.

Designing the technology infrastructure for institutions of higher education is a strategic decision that affects the quality of the educational experience for students and faculty (Demb, Erickson, & Hawkins-Wilding, 2004). In their study on students' reactions to a campus-wide laptop computer initiative, Demb et al. have found that the laptop computer is an "essential" part of college learning for students (i.e., for typing papers, accessing the Internet, searching for research references, making PowerPoint presentations, and storing information), making a significant difference in students' study habits as well as their academic and social lives. In other words, the laptop computer extremely helps college students with classroom assignments, e-mail messages, and individual research or projects for the course. The above study has also found that student perceptions of the value of the laptop computer to their academic success are tightly correlated with their perceptions of the success of faculty in integrating the laptop computer into classroom activities. However, the strength of student frustration about the cost structure of the laptop usage was one of the most striking findings. In conclusion, Demb et al. have emphasized that gaining sufficient experience with a new computer system to achieve "teaching fluency" requires a substantial investment of time and attention on the part of the instructor.

Dodds (2003) points out the startling growth of new technologies and of the popularity of open and distance learning delivery approaches. Online distance learning provides answers to the problems of *availability* (such as accessibility and cost) and the demand for *flexibility* (such as time, place and pace) of higher learning, and technology-mediated learning and online distance education are becoming major vehicles for fulfilling the needs of lifelong learning (Beller, 1998).

Technology and Diversity in Higher Education

Characteristics of online distance learning related to research studies vary yet reflect some combination of demographic variables such as age, gender, and ethnic background (Thompson, 1998). According to Thompson, (1) researchers generally agree that distance education students are, on average, older than typical undergraduate students; (2) most studies of distance learners in North American higher education report that more women than men are enrolled in courses delivered at a distance, making generalizations about the relative participation of ethnic minorities in distance education difficult; and (3) distance education is an especially appealing way for students from disadvantaged socio-economic groups to enter higher education. Although

comprehensive accurate statistics are not yet available on women learning through distance education, most distance learners are women and distance education continues to offer women opportunities to enrich their lives and to expand their earning power (Burge, 1998). Even though computer technology experiences are as varied as the individuals who use computers, both men and women voice positive attitudes toward online learning—that is, despite many variables, gender does *not* significantly affect student perceptions of distance education (Peters, n.d.).

Advocating that there is no gender difference in the use of e-mail, Gefen and Straub (1997) suggest that gender should be included in information technology diffusion models along with other cultural effects and that the same mode of communication may be perceived differently by the genders. Generally, boys love the computer or the machine for itself and like to spend long hours tinkering and game-playing on computers, whereas girls are far more likely to reject emotional identification with the computer or the machine as a second self and instead think of it in dispassionate and instrumental terms as just a tool (Sofia, 1998): "Gender differences in attitudes toward computers and styles of computer learning could be interpreted differently from a perspective that is critical of *technotopianism* (technological utopianism), alert to *masculinist* bias, and more sensitive to the relations between individual and cultural imaginaries" (p. 30).

Koohang's (2004) study focused on students' perceptions toward the use of the digital library in weekly Web-based distance learning assignments portion of a hybrid instructional program and found that age is not a significant factor but gender and prior experience with the Internet are significant factors. In other words, male students have significantly higher positive perceptions toward the use of the digital library, and students who have more prior experience with the Internet have significantly higher positive perceptions toward the use of the digital library.

Inoue's (1999-2000) study searched for an answer to the question of whether or not gender differences would associate with academic status (graduate vs. undergraduate students) on university students' preference for learning by computer-assisted instruction (CAI). The results of ANOVA have found that the main effect of gender is not significant, whereas the main effect of academic status is significant. This means that graduate students do favor CAI more than do undergraduate students. The study has further indicated the significant differences between undergraduate females and graduate males, supporting the assumption that computer experiences have a stronger effect than do gender differences on attitudes toward the use of computers in learning. It may be that graduate students have more computer experiences. Since computer literacy skills increase as time passes, the chance of "give CAI a try" becomes higher. Although Inoue's study does not reveal exactly why graduate students favor CAI more than do undergraduate students, such learning experiences as using CAI give maximum opportunities to all students with different backgrounds and academic expectations in the graduate program.

Finally, the importance of recognizing the cultural diversity of students has inspired much recent discussion and research in higher education; racially diverse environments, when properly nurtured, lead to both quantitative and qualitative gains in educational outcomes for all students, including higher retention rates and greater overall satisfaction with college (Ila-Parasnis, 2005).

Method

Fink (1995) has identified six requirements for a useful survey: (1) specific, measurable objectives; (2) sound research design; (3) sound choice of population or sample; (4) reliable and valid instruments; (5) appropriate analysis; and (6) accurate reporting of the results. Each of these requirements was considered in relation to the survey questionnaire for the present paper.

The Questionnaire

Specific, measurable objectives. Preparing specific, measurable objectives is the first step in a good survey project. Patten (2001) has made the following pertinent observations in this regard as follows: if the objective is too broad, it is difficult to provide questionnaire items that are effective and relevant; the objectives, as developed, should be reviewed by external experts before proceeding; and the literature relevant to the objective should be thoroughly reviewed. The questionnaire in the present study was designed to answer the specific questions below:

1. Is there a difference in perceptions of computer technology experiences between females and males (1 = Female; 2 = Male)?
2. Is there a difference in perceptions of computer technology experiences among various academic status groups (1 = Freshman; 2 = Sophomore; 3 = Junior; 4 = Senior; 5 = Graduate)?

Sound research design. With respect to this second criterion, Fink (1995) has observed that a survey design is "a way of arranging the environment in which a survey takes place" (p. 3). In designing a survey questionnaire for the present study, account was taken of the basic question of the feasibility of administering the survey questionnaire to the population of interest, and the questionnaire design was modified appropriately. Although the *five* choices are adequate for most research purposes, Likert-scale items can have up to about *seven* choices without requiring respondents to make falsely fine distinctions: 'very strongly agree,' 'strongly agree,' 'agree,' 'neutral,' 'disagree,' 'strongly disagree,' and 'very strongly disagree' (Patten, 2001). "Since 1930," in Patten's (2001) words, "other item types have been developed to measure attitudes. Interestingly, however, extensive research indicates that none of them are clearly superior to Likert-scale items, which are easy to write and easy for respondents to understand" (p. 34).

Along with demographic question items (gender, ethnicity, academic status, and age), the survey reported in the present paper had the sixty-two (62) Likert scale questions (such as "I am very comfortable using a personal computer"), allowing the participants to respond to each question in terms of five degrees of agreement (ranging from 1 = 'strongly disagree' to 5 = 'strongly agree'). The survey was reviewed by colleagues and then by the Committee on Human Research Subjects (CHRS) to ensure that the rights of the participants were protected.

Sound choice of population or sample. With respect to this third criterion, sampling methods are usually divided into two types: probability sampling and non-probability sampling. For the present study, eight classes were selected randomly from among all the courses offered in the School of Education at an American Pacific island university in the fall semester of 2005. This university—the only four-year institution of higher learning in Micronesia—was defined as a minority university by the U.S. Department of Education (90% of the students of this university were non-European descent). The courses selected for the survey were both foundations courses and teacher education courses in undergraduate and graduate programs. The population of the study was the entire group of students enrolled in education courses during that semester. The demographic information of the study participants (N = 174) is summarized in Table 1.

Reliable and valid instruments. With respect to this fourth criterion, a survey questionnaire should contain items that are pertinent to the objectives. In brief, "valid data come from surveys that measure what they purport to measure" (Fink, 1995, p. 5). The survey reported in the present paper was reviewed to ascertain that the extent to which inferences and uses made on the basis of scores from the survey instrument were reasonable and appropriate (validity) and that the

questionnaire items would be clearly understood by the participants (reliability). The following guidelines for developing useful survey instruments by Wiersma (2000) were considered in developing the questionnaire of the present study:

- except for possibly a few items that request background or demographic information, items should relate directly to the research questions;
- items should be clear and unambiguous;
- only one concept should be included in a single item;
- the use of leading questions should be avoided;
- only information that the respondent is able to provide should be requested;
- shorter items are to be preferred to longer items; and
- simpler items are to be preferred to complex items.

The present survey was pilot tested using 31 students independent of the sample of respondents used in the present study. The reliability coefficient (Cronbach's alpha) from the results was .920. This suggested that the survey instrument was stable enough to determine students' perceptions of technology experiences. According to Chen and Krauss (2004), however:

> …reliability coefficients only inform about the *relative* amount of random inconsistency of individuals' responses on a measure. A test with a Cronbach's alpha of .90 suggests that the test is more internally consistent than another test with a Cronbach's alpha of .70. However, both reliability estimates do not provide *absolute* indications regarding the precision of the test scores. (p. 955)

Appropriate analysis. With respect to this fifth criterion, although surveys can use a variety of conventional statistical procedures to analyze the data, the appropriate analysis depends on the survey aims (such as description, comparison, and correlation) and the size of the sample.

The overall means (*M*) and standard deviations (*SD*) for all the respondents by all the questions were calculated. Then ANOVA procedure was conducted to answer four questions that informed the research objectives; the *F* statistics generated from the analysis. A predetermined level of significance (alpha = .01) was chosen for the analysis. Qualitative data (student essays on technology use and self-directed learning) were also analyzed to support quantitative data. Graduate students ($N = 25$) in two classes participated in this essay project in fall 2005.

Accurate reporting of the results. With respect to this sixth criterion, Fink (1995) has noted that accurate survey reports require knowledge of how to use tables and figures to present information. In the present survey, both nominal data and ordinal data (i.e., categorical data such as gender, and age) were summarized in tables. Tables are useful and effective in most cases, although it should be noted in passing that Patten (2001) is of the opinion: "Generally, figures are more eye-catching, and many people find them easier to interpret than tables" (p. 90).

Results and Discussion

A total of 174 responses were useable for the present questionnaire research. As seen in Table 1, 69% of the participants were female and 31% male. This contrast was expected because 62% of the entire student body of this university was female; and, the majority of the students in the School of Education, particularly in the Teacher Education Program, were female in this university. About 38% of the participants were graduate students, and 62% undergraduate students (12.1% Freshman; 17.2% Sophomore; 20.7% Junior; and 12.1% Senior).

Table 1. Demographic Information of the Survey Participants

	N	Percent
Gender		
Female	120	69.0
Male	54	31.0
Total	174	100.0
Academic status		
Freshman	21	12.1
Sophomore	30	17.2
Junior	36	20.7
Senior	21	12.1
Graduate	66	37.9
Total	174	100.0

Computer Technology Experiences

Among 62 questions, 14 were selected to determine the students' specific perceptions of computer technology experiences. The reliability coefficient alpha across the 14 questions was .808, suggesting that these questions were measuring the same thing. The overall results of descriptive statistics indicated that students of this sample perceived that the use of computer technology was a positive learning experience (see Table 2). The three most 'strongly agree' occurring questions were: "comfortable using a personal computer" (72.4%); "rely on computers in doing school assignments" (66.1%); and "can create a PowerPoint presentation" (55.7%).

Table 2. Descriptive Statistics for Perceptions of Computer Technology Experiences (N = 174)

Questions	Strongly Agree	Agree	Not Sure	Disagree	Strongly Disagree
Q1. I am very comfortable using a personal computer.	126 72.4%	39 22.4%	4 2.3%	3 1.7%	2 1.1%
Q2. I rely on computers in doing school assignments.	115 66.1%	52 29.9%	2 1.1%	3 1.7%	2 1.1%
Q6. I use computers to help keep me organized.	67 38.5%	72 41.4%	14 8.0%	20 11.5%	1 0.6%
Q7. I use computers to produce artistic, innovative projects.	95 54.6%	54 31.0%	9 5.2%	13 7.5%	3 1.7%
Q11. I like to play computer games.	65 37.4%	59 33.9%	17 9.8%	24 13.8%	9 5.2%
Q12. I read and send e-mail messages almost every day.	72 41.4%	60 34.5%	13 7.5%	25 14.4%	4 2.3%
Q18. I use word processing more than any other program.	72 41.4%	65 37.4%	18 10.3%	17 9.8%	2 1.1%
Q22. Internet access is essential if I am to do a good job in my class.	82 47.1%	56 32.2%	15 8.6%	17 9.8%	4 2.3%
Q24. I read most of my news on the Internet.	67 38.5%	67 38.5%	9 5.2%	27 15.5%	4 2.3%
Q25. I use the Internet for research more than the library.	92 52.9%	46 26.4%	11 6.3%	21 12.1%	4 2.3%
Q36. I enjoy online chat rooms or discussion groups.	29 16.7%	43 24.7%	19 10.9%	53 30.5%	30 17.2%
Q42. I can create a PowerPoint presentation.	97 55.7%	41 23.6%	11 6.3%	19 10.9%	6 3.4%
Q49. I believe technology helps teachers teach better.	96 55.2%	44 25.3%	12 6.9%	14 8.0%	8 4.6%
Q50. I believe technology helps students learn better.	93 53.4%	51 29.3%	19 10.9%	8 4.6%	3 1.7%

As seen in Table 3, overall, students of this sample are “very comfortable using a personal computer” (*M* = 4.63; *SD* = .72), and “rely on computers in doing school assignments” (*M* = 4.58; *SD* = .71). For them “Internet access is essential to do a good job in the class” (*M* = 4.12; *SD* = 1.07). They use computers “as word processors” (*M* = 4.08; *SD* = 1.01), “to read and send e-mail messages” (*M* = 3.98; *SD* = 1.13), “to organize the course work” (*M* = 4.06; *SD* = .99), “to produce more artistic, innovative projects” (*M* = 4.29; *SD* = .99), “to create a PowerPoint presentation” (*M* = 4.18; *SD* = 1.15), “to search for research references” (*M* = 4.16; *SD* = 1.12), “to read daily news on the Internet” (*M* = 3.95; *SD* = 1.23), and “to play computer games” (*M* = 3.84; *SD* = 1.21), but they do not “join online discussion groups” (*M* = 2.93; *SD* = 1.38). The students of the sample fairly strongly believe: “technology helps teachers teach better” (M = 4.18; *SD* = 1.15); and “technology helps students learn better” (*M* = 4.28; *SD* = .95).

The fact that the students “read and send e-mail messages almost every day” (41.4% marked ‘strongly agree’; and 34.5% ‘agree’) suggests that through e-mail students are able to contact each other with questions about assignments and collaborative work, strengthening communication and ties among classmates. The integration of the e-mail system into learning is very much a “student-led process”; the adoption of e-mail by students has transformed university cultures as departments have used it as a channel for faculty-student contact (Breen, Lindsay, Jenkins, & Smith, 2001). As previously mentioned, in addition to the laptop computer, the e-mail system is making a significant difference in college students’ study habits (Demb et al., 2004).

Table 3. Means and Standard Deviations for Student Perceptions of Computer Technology and Distance Education

	N	Min.	Max.	Mean	SD
Q1	174	1.00	5.00	4.6322	.72311
Q2	174	1.00	5.00	4.5805	.71472
Q6	174	1.00	5.00	4.0575	.98961
Q7	174	1.00	5.00	4.2931	.98559
Q11	174	1.00	5.00	3.8448	1.21363
Q12	174	1.00	5.00	3.9828	1.13011
Q18	174	1.00	5.00	4.0805	1.00540
Q22	174	1.00	5.00	4.1207	1.07107
Q24	174	1.00	5.00	3.9540	1.12674
Q25	174	1.00	5.00	4.1552	1.12463
Q36	174	1.00	5.00	2.9310	1.38358
Q42	174	1.00	5.00	4.1724	1.16010
Q49	174	1.00	5.00	4.1839	1.15332
Q50	174	1.00	5.00	4.2816	.95325

The results of the ANOVA analysis indicated that gender (F (1, 172) = .275, $p > .01$) and academic status (F(4,169) = 2.506, $p > .01$) were both *not* statistically significant factors for this sample (see Table 4). There were no differences in student perceptions of computer technology experiences (1) between females and males and (2) among various academic status groups. The fact that none of these demographic variables are statistically significant strongly suggests that perceptions of computer technology experiences are different individually and are *not* influenced by demographic factors.

Table 4. Analysis of Variance Summaries for Student Perceptions of Computer Technology

Scale	SS	df	MS	F
Gender				
Between Ss	6.125	1	6.125	.275
Within Ss	3824.800	172	22.237	
Academic status				
Between Ss	214.526	4	53.632	2.506
Within Ss	3616.399	169	21.399	

As Lim (2004) has noted, another implication for instructional practice is that technology-enhanced learning can empower students' self-directed, inquiry-based learning by increasing student involvement and responsibility for their own learning. As previously pointed out, the following five stages of the inquiry-based learning system should be clearly understood: Articulate own problems; design problem-solving strategies; explore resources for solving problems; provide solutions; and discuss the implications for further refinement. This learning system *will* definitely become ever more important in higher education in the digital age.

In the history of American higher education, people have commonly perceived professors differently: In the colonial period, the professor has failed as an instructor if a student has not learned; in the nineteenth century, the professor should help students develop the capacity to become independent learners; and in the twentieth century, the professor should be less directive and act more as a facilitator for students' learning. In the twenty-first century, as Janicki, Schell, and Weinroth (2002) has noted, the role of the professor is shifting fundamentally from an *expert* dispensing knowledge (i.e., refers to professor as expert model, textbook as primary source, and emphasis on product or outcome) to a *resource* or a *guide* (i.e., refers to professor as facilitator, variety of sources or media, and emphasis on process and experience). This shift accelerates "resource-based" teaching, which in turn "emphasizes the use of computers and software, encourages student and faculty contact, encourages cooperation among students, encourages active learning, gives prompt feedback, emphasizes time on task, communicates high expectations, and respects diverse talents and ways of learning" (Matthews, 2000, p. 58).

Most of the participants of the present survey were in the teacher education program. Upon completion of the general preparation component of their program, prospective teachers should meet the following National Educational Technology Standards for Teachers (ISTE, 2000):

- technology operations and concepts (e.g., demonstrate continual growth in technology knowledge and skills to stay abreast of current and emerging technologies);
- planning and designing learning environments and experiences (e.g., design developmentally appropriate learning opportunities that apply technology-enhanced instructional strategies to support the diverse needs of learners);
- teaching, learning, and the curriculum (e.g., use technology to support learner-centered strategies that address the diverse needs of students);
- assessment and evaluation (e.g., use technology to collect and analyze data, and communicate findings to improve instructional practice and maximize student learning);
- productivity and professional practice (e.g., use technology resources to engage in ongoing professional development and lifelong learning); and
- social, ethical, legal, and human issues (e.g., promote safe use of technology resources).

What is more, keeping up with current and emerging technologies, prospective teachers have to provide *technology-enhanced* instructional strategies as well as *learner-centered* strategies in order to improve teaching and to maximize student learning, promoting *lifelong learning*.

As the present study has revealed, college students are very familiar with computer technology and its applications, confirming Sheard and Lynch's (2003) study that college students' affective responses to the Internet-based learning environments are often related to their familiarity with the learning environment, and their skills and confidence with technology.

Students Voices on Technology

The students of two graduate classes of educational research courses participated in developing a one-page essay about their perceptions of computers and information technology based on three specific questions. Many of the participants were K-12 school teachers and administrators. The typical answers of the participants for each question are summarized below:

1. How are you prepared for the challenges of the information age?

- "I will continue to develop the skills necessary to utilize new and emerging technologies."
- "I constantly seek new information by surfing the Internet, and reading current journals."
- "I use technology to create worksheets, lesson plans, report cards, newsletters, and teaching materials for my middle school students."
- "I am taking computer applications and computer programming courses."
- "Proper assimilation of both organizational and research information tools into the teaching and learning process will be the best way for teachers."

2. Do you possess the skills and motivation required for self-directed, lifelong learning?

- "I embrace challenges, dynamic, information-rich society by keeping my senses active."
- "I am very motivated to learn things through formal and informal education."
- "I am always searching for new ideas and alternative perspectives."
- "I am an independent and autonomous learner who takes responsibilities for my learning."

3. How can professors help students to better prepare and improve information literacy skills?

- "By setting a good example, it is always exciting to take a course where the professor energizes enthusiasm for learning by introducing new electronic media into the curriculum."
- "By forcing students to use the various technologies as part of the course assignments."
- "By creating venues in which information literacy skills can be utilized in the curriculum."

In summary, many of the students participated in this essay project have pointed out the fact that today both professors and students have unlimited resources to teach and learn, providing accommodation to a range of people with a variety of needs for learning. The participants are ready to assimilate *new* experiences that become available in education to support the learning process. They also realize that they must adopt the attitude of a risk-taker, remaining open-minded to innovative possibilities and *new* alternatives. Finally, students have emphasized that in the past the number of decade, distance learning and computer-based degree programs have been tremendously explored. This has made it possible for individuals who previously would not have had an opportunity to participate in degree programs, especially in graduate studies.

Conclusion

Schools and universities of today are also becoming more ethnically, culturally, and racially diverse. It is generally viewed that technology should increasingly fit *all* learners and that teachers are challenged to provide meaningful, relevant, and motivating educational interventions to *all* learners. Universities must combine their traditional roles of extending the boundaries of knowledge and passing on that knowledge to the leaders of tomorrow with a commitment to make higher education available to *all* individuals through massively extended university outreach and the provision of opportunities for mass higher education through the use of media, educational technology, libraries, and distance education (Dodds, 2003).

The survey reported in the present paper was conducted in a university, where the student population was no more than 3,000, in the western Pacific. As the present study has indicated, overall, students' attitudes toward information technology are highly positive. There are no differences in students' perceptions of computer technology experiences between females and males as well as among various academic status groups. One practical explanation for the results may be that this university is situated in a small island and people go to the same high schools and, consequently, their patterns of thoughts, expectations, and behaviors are merged through their academic and social interactions.

While professors are becoming more self-proficient using technology, they are not yet at the point of enhancing their pedagogy (Nisbet, 2005). However, Nisbet's emphasis is the following:

> …research has become part of every professional role today and, in education, one task of professional or faculty development is to weave a research element into the expertise of their teaching, leading them to adopt at a personal level the self-questioning approach, which leads to reflection and understanding and from there into action. (p. 43)

As cited in the beginning of the present paper, the teacher-researcher movement has brought momentous changes in professional development for teaching professions. It is useful for faculty members to conceptualize a reciprocal relationship between teaching and research. Teaching gives direction and purpose to research endeavors while, simultaneously, research ensures that teaching is continuously updated and improved. It is true, indeed, that technology has enormous potential to enhance instructional practice, including pedagogical knowledge, beyond what traditional methods allow. By expanding the use of technology both in research and in teaching, faculty members can help university students use technology to enhance their learning.

The present study was conducted based on three inquiries: (1) Are today's college students well prepared for the challenges of the information age? (2) Do students possess the skills and motivation required for self-directed, lifelong learning? (3) How can educators help students to better prepare and improve information literacy skills? It is fair to say that students of the current study sample are prepared for the challenges of the information age, and are motivated for self-directed, lifelong learning. Maintaining and updating their Web site for the course, professors are able to demonstrate how to access Internet information from different sources such as online databases and instantaneous communication with experts worldwide. This will help students find timely information for the course work and improve information literacy skills as well. Professors using the Web in the classroom demonstrate to students that their mastery of technology, knowledge, and skills in teaching are up-to-date. In due course, professors have to learn how to create a Web page, download a graphic, or even create an audio file, just as once they had to learn how to use the overhead projector or the tape recorder (Ko & Rossen, 2004).

The questionnaire research reported in the present paper was a small, exploratory study conducted in the School of Education at a university in the western Pacific. Future research is definitely required that is sampled in such a way as to ensure that the findings can be generalized to the entire student body of this university. Future research can be conducted with a different population sample and improvement of the research instrument. In this university, research on technology integration into teaching and learning is in its infancy. Research endeavors are very much needed so that reinforcement of faculty and student training, technical support for faculty and students, and classroom maintenance are recommended to administrators and policy makers to use technology for reshaping the diverse learning environment in higher education.

References

Agre, P. E. (1999). Information technology in higher education: The global academic village and intellectual standardization. *On the Horizon, 7*(5), 8-11.

Beller, M. (1998). The crossroads between lifelong learning and information technology. *JCMC, 4*(2). Retrieved April 24, 2005, from http://www.ascusc.org/jcmc/vol4/issue2/beller.html

Breen, R., Lindsay, R., Jenkins, A., & Smith, P. (2001). The role of information and communication technologies in a university-learning environment. *Studies in Higher Education, 26*(1), 95-114.

Burge, E. (1998). Gender in distance education. In C. C. Gibson (Ed.), *Distance learners in higher education* (pp. 25-45). Madison, WI: Atwood.

Chen, P. Y., & Krauss, A. D. (2004). Reliability. In M. S. Lewis-Beck, A. Bryman, & T. F. Liao (Eds.), *The SAGE encyclopedia of social science research methods* (pp. 952-956). Thousand Oaks, CA: Sage.

Delamarter, S. (2005). Theological educators, technology, and path ahead. *Teaching Theology and Religion, 8*(1), 51-55.

Demb, A., Erickson, D., & Hawkins-Wilding, S. (2004). The laptop computer alternative: Student reactions and strategic implications. *Computers & Education, 43*, 383-401.

Dodds, T. (2003). Universities, adult basic education, open and lifelong learning and new technology. Retrieved April 24, 2005, from http://www.eldis.org/static/DOC13384.htm

Eynon, R. (2005). The use of the lute met in higher education: Academics' experiences of using ICTs for teaching and learning. Association of Special Libraries and Information Bureau *Proceedings, 57*(2), 168-180.

Fink, A. (1995). *How to design surveys*. Thousand Oaks, CA: Sage.

Gefen, D., & Straub, D. W. (1997). Gender differences in the perception and use of e-mail: An extension to the technology acceptance model. *MIS Quarterly, 21*(4), 389-400.

Ila-Parasnis, V. J. (2005). Deaf college students' attitudes toward racial/ethnic diversity, campus climate, and role models. *American Annals of the Deaf, 150*(1), 47-58.

Inoue, Y. (1999-2000). The university student's preference for learning by computer-assisted instruction. *Journal of Educational Technology Systems, 28*(3), 277-285.

International Society for Technology in Education (ISTE). (2000). National educational technology standards for teachers (brochure). U.S.: Author.

ISTE. See International Society for Technology in Education.

Janicki, T. N., Schell, G. P., & Weinroth, J. (2002). Developing of a model for computer supported learning systems. *International Journal of Educational Technology, 3*(1). Retrieved July 5, 2005, from http://www.outreach.uiuc.edu/ijet/v3n1/janicki/index.html

Ko, S., & Rossen, S. (2004). Teaching online: A practical guide. New York: Houghton Mifflin.

Kompf, M. (2005). Information and communications technology and the seduction of knowledge, teaching, and learning: What lies ahead for education? *Curriculum Inquiry, 35*(2), 213-233.

Koohang, A. (2004). Students' perceptions toward the use of the digital library in weekly Web-based distance learning assignments portion of a hybrid programme. *British Journal of Educational Technology, 35*(5), 617-626.

Lim, B-R. (2004). Challenges and issues in designing inquiry on the Web. *British Educational Communications and Technology, 35*(5), 627-643.

Matthews, G. E. (2000). Circuit simulation software in electronics courses. In D. G. Brown (Ed.), *Teaching with technology* (pp. 55-62). Bolton, MA: Anker.
Metzger, M. J., Flanagin, A. J., & Zwarun, L. (2003). College student Web use, perceptions of information credibility, and verification behavior. *Computers & Education, 41*(3), 271-290.
Moore, D. (1999). School + technology = changes. *School Planning & Management, 38*(3), 11.
Nisbet, J. (2005). What is educational research? Changing perspectives through the 20th century. *Research Papers in Education, 20*(1), 25-44.
Patten, M. L. (2001). *Questionnaire research.* Los Angeles, CA: Pyrczak.
Peters, L. (n.d.). *Student perceptions of online learning*. Retrieved June18, 2005, from http://www.collegedegreeguide.com/articles-fr/perceptions.htm
Roldan, M., & Wu, Y. D. (2004, July/August). *Building context-based library instruction. Journal of Education for Business*, 323-327.
Sheard, J., & Lynch, J. (2003). Accommodating learner diversity in Web-based learning environments: Imperatives for future developments. *International Journal of Computer Processing of Oriental Languages, 16*(4), 243–260.
Sofia, Z. (1998). The mythic machine: gendered irrationalities and computer culture. In H. Bromley & W. Apple (Eds.), *Education/technology/power* (pp. 29-51). New York: State University of New York Press.
Thompson, M. M. (1998). Distance learners in higher education. In C. C. Gibson (Ed.), *Distance learners in higher education* (pp. 9-24). Madison, WI: Atwood.
Van Soest, D., Canon, R., & Grant, D. (2000). Using an interactive website to educate about cultural diversity and societal oppression. *Journal of Social Work Education, 36*(3), 463-479.
Wiersma, W. (2000). *Research methods in education*. Needham Heights, MA: Allyn & Bacon.

Note: This paper is part of the chapter in a book, *Online Education for Lifelong Learning* edited by Y. Inoue, which will be published in 2007 by Information Science Publishing.