ACADEMIC ACHIEVEMENT AMONG PSYCHOLOGY UNDERGRADUATES ENROLLED IN WEBCT-ASSISTED RESEARCH DESIGN AND STATISTICS COURSES

by

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ABSTRACT

ACADEMIC ACHEIVEMENT AMONG UNDERGRADUATES

ENROLLEN IN WEBCT-ASSISTED RESEARCH

DESIGN AND STATISTICS COURSES

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The current study evaluated performance of 2443/2444 students and the use of WebCT. Undergraduate psychology majors at UT Arlington who successfully completed PSYC 2443 and 2444, Research Design and Statistics I and II, during the Fall/Spring semesters of 2006-2007, 2007-2008, and 2008-2009 semesters were part of this study (N=132). Students became more efficient users of WebCT over the course of the two semesters. Communication variables were significant predictors of performance (Lecture, Lab, and Total grade) in 2443 but not for 2444 performance. WebCT usage was predictive of Lab grades in 2443 and all performance variables in 2444. The current project yielded some interesting findings that have not been reported previously, which has stimulated some additional thinking about technology assistance in the classroom.

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CHAPTER 1

INTRODUCTION

The internet is everywhere; technology is everywhere. The use of the internet and computers in general are on the rise in classrooms all around the country. The generation that is currently in the college classrooms has basically been raised in an "online" world. Tapscott (2008) has given this generation a name, "Generation Net" or "Net Geners." He believes that pedagogy needs to change with the new way of thinking the "Net Geners" have instead of being stuck in the "pre-Gutenberg" way of teaching. Students today, according to Tapscott, want to converse in class instead of listening to a lecture and work in groups instead of working alone. He says the way "Net Geners" read is even different from conventional style, instead of reading a page they tend to skip sentences and paragraphs and will only stop to skim items they find important.

Another aspect of moving towards an online world is the change in communication flow between individuals in an online environment. Social information processing theory suggests that individuals communicating online should need more time to build up a relationship when compared to individuals that communicate face to face. However, Tidwell and Walther (2002) found that those using computer-mediated communication utilized more direct means of communication than those who were communicating face to face, thus resulting in participants reporting more effective communication in the online conversations. Participants were more direct with questions and answers in the online environment than in the face to face interactions. A more comprehensive theory is needed to address how formal education has been or will be impacted by internet-guided information flow.

Due to the increase in technology in our daily lives, the use of computers and the internet is on the rise in the classroom. The 2008 Campus Computing Survey (Green, 2008)

found that almost 68% of classrooms are outfitted with wireless internet (more than double the wireless internet access from 2004). Here at the University of Texas at Arlington (UT Arlington), classrooms are being outfitted with desktop computers for instructors, large projector screens, and high tech projection equipment. PowerPoint presentations are on the jump drives of most faculty and graduate teaching assistants. Many times one can find a link to a YouTube video or a webpage in the PowerPoint lectures as a supplement to the topic of the day. Many professors provide students with a website to visit to obtain the PowerPoints prior to lecture. Students sit in the classroom with their laptops and the ability to access the internet during class.

Many individuals have several favorite websites they visit on a regular basis, sometimes several times a day. The rise in social networking sites have led to an increase of internet usage among many college students. Sites such as Facebook and MySpace are among the most popular social networking sites along with instant messengers like AOL instant messenger (AIM), Yahoo messenger, and MSM messenger. And due to the advances in technology, not only can individuals access these websites from a traditional desktop computer; they can also access these sites on their laptop from various WiFi spots around campus, libraries, coffee shops, and even fast food restaurants like McDonald's. Cell phones are even capable of accessing the internet from anywhere. Cell phone providers have plans that allow for unlimited access to the internet with specialized phones like PDAs, Blackberries, and iPhones that come equipped with full keyboards. The internet is literally in the palm of your hand.

Typically, research is no longer done while sitting in the library and looking through the card catalog for a book or an article. Nowadays all one has to do is type in the subject matter in a search engine and the first website that often pops up with information galore is Wikipedia. Though it can be edited and changed by anyone who has access to the internet, many people take what is found on these pages to be reliable and comprehensive. Misinformation is easy to find in the world of Wiki. Complete books can now be found online – eBooks. The traditional newspaper, though still in circulation, is not the first line of daily information for a generation of

internet users; it was replaced by television newscasts, and now has been replaced by news feeds and online versions of newspapers and news programs.

It is well known that online shopping is gaining popularity. The Forrester Research report projected a 10% increase in online retail over the next five years with a projection of $229 billion in revenue (Evans, Sehgal, Bugnaru, McGowan, 2009). Most retailers have websites where anything can be purchased online and shipped straight to your home or business. Music can now even be purchased online by the song or the album due new technological creations like iTunes. Everything from purchasing car insurance to trading in the stock market can be done at the touch of a mouse or a click of the cell phone button.

The educational system is even turning to the online environment to conduct business. eUniversities are popping up on television commercials and in ad space on social networks such as FaceBook and MySpace. Studies have found that online enrollment has increased 12.9% from 2006 to 2007 whereas higher education in general showed a 1.2% increase (Carter, 2008). More recent data suggest that almost half of universities are reporting a 15% increase in online enrollment between 2006 and 2009 and nearly half of all universities survived (47%) expect online enrollment to increase by 15% over the course of the next three years (Green, 2009). Email is now the official source of communication here at UT Arlington. To register for classes one must log on, create a profile, and browse the college catalog and schedule of classes. Classes chosen go into the shopping cart, making it feel more like a retail website. An eCommerce format has been adopted for enrollment. Information about students is no longer changed with hand- or typewritten letters, it can now all be done online, and that is the preferred method by the administration.

Libraries are now online and students and faculty can access any book or journal article from the comfort of their home or office. Very rarely do individuals have to walk to the library to find the information they are looking for, make photocopies of articles or book chapters, or check out books or journals. Most textbooks come equipped with websites that have online

resources such as outlines, PowerPoint slides, quizzes, and tutorials. The use of websites such as Blackboard and WebCT to post grades, handouts, assignments, online quizzes and exams are increasing in usage among professors and graduate teaching assistants. Experienced GTAs are asked on a regular basis to give tutorials to others who are new to such technology.

At the UT Arlington campus, WebCT is the platform used by professors to supplement or teach their classes. It archives all materials posted, all emails, and discussion board topics. As stated on the WebCT website:

> The University of Texas at Arlington offers its students the opportunity to supplement their on-campus course work or even take entire degree programs online.
>
> WebCT is a web-based e-learning environment. In this virtual classroom professors can post lectures, class notes, assignments, grades, online quizzes and more. It facilitates communication between faculty and students via integrated email, chat and bulletin boards.
>
> Perhaps its biggest advantage is that WebCT allows students access to information at any time of the night or day. WebCT is used for courses taught by UTA faculty in:
>
> a) Regular class rooms on campus with supplemental materials online
>
> b) Blended delivery with some online classes and some on campus classes
>
> c) 100% online class with no on campus meeting times required (WebCT, 2008, 3-6)

PSYC 2443 (Research Design and Statistics I) and 2444 (Research Design and Statistics II) integrates the previously “stand-alone” courses of PSYC 2441 (Statistics) and PSYC 2442 (Experimental Design), courses that were previously required prior to majoring in

psychology. The 2443/2444 sequence utilizes WebCT as a way of communicating with students, allowing students to:

- communicate amongst themselves via the discussion boards
- email the lecturer and teaching assistants
- access grades
- and download various assignments and PowerPoints

The lecturer and graduate teaching assistants use WebCT to:

- post PowerPoints and various handouts in different areas on WebCT (Course Materials and the Lab Backpack)
- post practice problems prior to exams
- post grades
- and email students

WebCT also has a “test yourself” feature that is used for practice for the lecture portions of exams. WebCT is also a place where various statistics jokes and videos are posted for students to view.

Friedman (2007) examined the use of WebCT as a tool for administrative purposes among faculty who were not always present for meetings. It was found to improve communication; it helped the progress of administrative duties, and aided in cooperation between many of the faculty members. WebCT was used as a tool to post pertinent information such as meeting agendas, meeting minutes, and other administrative information as well as providing a place for committee members to chat about duties. The results were mixed due to some resistance to the technology (about 40% of faculty never logged on) but overall WebCT was found to be a valuable device for those who used it.

In 2005, Heffner and Cohen examined the use of WebCT among students and found grades were positively correlated with WebCT access. A survey of the students showed that

almost 90% of them accessed the internet on a daily basis. A study by Limniou, Papadopoulos, and Whitehead (2009) discovered that in a pre-laboratory chemistry course the use of classroom teaching along with Web CT enhanced the teaching procedure compared to groups who were strictly learning in a traditional class and those strictly learning in a web-based environment.

Student engagement, the "quality of effort and involvement in productive learning activities" (Kuh, 2009, p. 6), is an important part of student development and scholarship. As students spend more time involved in a subject they increase their knowledge base and become better at dealing with constructs and information which leads to a deeper understanding of the material (Kuh, 2009). It aids in skill building and management of several types of tasks and can lead to increased productivity in life after undergraduate work (Kuh, 2009). The National Survey of Student Engagement (NSSE) was developed to assess student engagement and provide a powerful tool that could improve learning environments for students across several institutions. Kuh (2009) outlined the history of the NSSE project and discussed the importance of tool in improving undergraduate experience. NSSE has steadily increased in usage among institution since its first year in 1999 beginning with 140 schools and with a total 772 schools in 2008.

Engaging students in the classroom can sometimes be a difficult task; engaging them outside of the classroom can be even more difficult. The introduction of technology in and outside of the classroom can add to the learning environment and create a more engaged student. Students can only be engaged during class if they show up. Implementing an attendance policy and allotting points for attendance can ensure that an audience of students is present, but once students are in their seats, the instructor must engage them in learning. The introduction of "clicker" systems has allowed for in-class student engagement to be possible. UT Arlington has adopted the Classroom Performance System though there are several versions of the technology available. "Clickers" provide a platform for asking questions of students and

allowing for immediate feedback. They also provide anonymity in answers so students have no need to feel called out or embarrassed by giving an incorrect answer. Clickers are a tool in active learning and engagement. Gauci, Dantas, Williams, and Kemm (2009) found that students who used clickers in a large lecture section of science students had better overall exam performance compared to the students who did not use the technology. They noted that instructors reported student engagement was increased due to the use of the clickers.

Engaging students outside of class can be achieved by utilizing web-based content and providing it in a platform that can be accessed anywhere at any time. WebCT is a way to allow students to remain engaged even when class time is over. Hrastinski (2009) argued that online learning is driven by student engagement and participation and that it is a process that is maintained by contact with others and finds that other factors do not play as important of a role in student learning. A study examining perceptions of learning from students' perspectives revealed that most students believed technology had improved learning (mean value of 0.80) and very few believed that learning came from books or lectures (mean value 0.31 & 0.34, respectively) (Rogers, 2004). Feedback received from students also indicated they felt more at ease asking questions without feeling "stupid" and allowed for open discussion and the sharing of information. Another study examining feedback on WebCT use found that about half of the students believed it sustained interest in the course and around 40% thought it helped them learn faster (Morss, 1999). Morss also found that the majority of students believed the use of WebCT should be continued in the course (~70%) and more materials should be posted on WebCT (~60%). McFarlin (2008) found that compared to a traditional lecture course a hybrid lecture-online format increased students grades by a full letter grade (9.9% higher scores).

Extensive research has been done comparing classroom instruction ("face-to-face") with Distance Education (DE). The two methods have been found to be comparable though the results are quite variable (Bernard, Abrami, Lou, Borokhovski, Wade, Wozney, Wallet, Fiset, & Huang, 2004). Results from the study comparing DE and classroom performance found that

one cannot advocate one type over the other, or even that they are equal, due to the large range in effect sizes for the outcome achievements measured (retention, achievement, and attitude). The issue, as pointed out by Smith and Dillon (1999) (as cited in Bernard et al., 2004), is the lack of clarity in descriptions of "media attributes" in published experiments which doesn't allow for proper comparisons. For an extensive review and Meta analysis of the literature see Bernard et al. (2004).

Preliminary Study 1

Foundation courses for the psychology major typically include statistics along with experimental psychology or experimental design (e.g. Messer, Griggs, & Jackson, 1999) With the exception of some "elite" institutions, the majority of psychology departments offer separate courses in introductory statistics and general research methods and few offer integrated statistics and methods courses (Friedrich, Buday & Kerr, 2000). Yet recent research suggests that integrative learning is essential to the acquisition and retention of knowledge, providing improved student satisfaction as well as better overall career preparation (Huber & Hutchings, 2004).

Upon reviewing the undergraduate curriculum in psychology at the UT Arlington, it was noted that students often delayed their enrollment in statistics, a sophomore-level course, which in turn, further delayed their enrollment in experimental design, also a sophomore level course (Autrey & Mann, 2008). Moreover, poor performance in experimental design appeared to be associated with a long interval between the two courses, resulting finally in a delay in the time to graduate. This outcome is due to the fact that successful completion (i.e. achieving a 'C' or better) of the two subject areas is required for students to be admitted to the advanced laboratory courses required for B.S. and B.A. degrees. Changes in student performance and time to graduate were quantified while curriculum was reformed as part of the department's quality enhancement plan (QEP).

It was predicted that students who were taught statistics and experimental design from an integrated perspective would achieve higher test scores and graduate sooner than those who were taught in the more traditional manner with “stand-alone” courses in statistics and experimental psychology. As is the case for many psychology programs across the nation, the courses are required for entry into the psychology major at UT Arlington. In addition, these courses are evaluated critically by faculty who serve on graduate admission committees in psychology, so they are courses vital to the future preparation of professional psychologists.

The samples included undergraduates enrolled at UT Arlington, a public, state-supported institution with ~24,000 students (data from 2007) from the Dallas Fort Worth Metroplex. The six-year graduation rate for the university has varied between 30-40% for the last 10 years. Class sizes varied between ~50-80 for the stand-alone courses and 110-150 for the integrated courses. For all courses, each student also enrolled in a two-hour laboratory section with the class size ranging between 18-22 students per section. A single Graduate Teaching Assistant taught a single section.

Undergraduate students had previously enrolled in the stand-alone courses PSYC 2441 Statistics and PSYC 2442 Experimental Psychology (cohort 1, N = 49) and others were enrolled in the revised courses, PSYC 2443 and PSYC 2444 Research Design and Statistics I and II (cohort 2, N = 48), the latter courses being those in which statistics and design had been fully integrated. There was no significant difference between the cohorts in the number of semesters to begin the two sequences. The names of all pre-majors, all demographic variables, and all grades were coded using a random number generator and all files were password protected.

In this preliminary report, (1) the time (in number of semesters) that elapsed between the two courses within each sequence and (2) the time (in number of semesters) to graduate from the time of completion to part one (2441 or 2443) and part two (2442 or 2444) of each of the two-course sequences were evaluated. Student self-evaluation measures were examined as well.

The offering of an integrated sequence of design and statistics (PSYC 2443 and 2444) led to a significant reduction in the time between course enrollments when compared to the stand-alone course sequence, PSYC 2441 and 2442 (t (95)=3.530, p <.001). As shown in Figure 1, almost all students who had completed 2443 immediately enrolled in 2444. However, students enrolled in 2441 often delayed enrollment in 2442, averaging a one-half semester delay with a range of 0-5 semesters.

To appreciate the effects on the time to graduate, cohorts of students who had completed the first course in each sequence, either PSYC 2441 or 2443, were compared. As shown in Figure 2, those who had taken the integrated course, PSYC 2443, graduated in significantly fewer semesters than those in the stand-alone statistics course, PSYC 2441 (t (95)=4.45, p < .001). Since the latter cohort averaged 4.3 semesters compared to the former cohort with 3.4 semesters, this represents nearly a full year's difference in the time to graduate.

Finally, when time to graduate was measured from the second course in each sequence, PSYC 2442 and 2444, those in the integrated course once again exhibited a significantly shorter time to graduate (t (95)=3.19, p <.001). Comparisons of means made between cohorts 1 and 2 were 3.1 and 2.4 semesters, respectively.

Overall, from the time of first enrollment in the two course sequence, those in cohort 1 took 7.3 semesters to graduate whereas those in cohort 2 took only 5.8 semesters, a 1.5 semester difference. Taken together with the data for the intervening time between the two courses in the sequence, a majority of those in the integrated sequence graduated 2 semesters, or a full year earlier.

To obtain a subjective measure of the students' own evaluation of their progress, we polled them after completing each of the two sequences. Using a subset of APA's Cyberguide Goals, we found that those in the integrated sequence consistently rated themselves more favorably than those in the stand-alone sequence (See Appendix A for the full APA Cyberguide

Goals). Likert scale scores were generally higher for those students on selected objectives under APA goals such as:

Goal 1: Knowledge Base of Psychology

Goal 2: Research Methods in Psychology

Goal 3: Critical Thinking Skills in Psychology

Goal 6: Information and Technological Literacy

Goal 9: Personal Development

One implication of the finding that the two cohorts differed in the time to graduate because of when they began and when they finished the two course sequence is that students may have been prepared differently for the courses and/or they may have been motivated differently to complete their degree plans. Compared to student profiles provided by national polls such as the NSSE, UT Arlington students are employed outside the university significantly more hours than those represented in the national sample. Thus, these data may have heuristic value for the planning of curricula for other students of psychology who, faced with rising tuition, seek additional hours of employment to meet those costs.

The 2008 NSSE report shows randomly selected students from UT Arlington and how they compared with the UT System, Selected Peers, and the overall NSSE (See Appendix B for subset of NSSE items, means, significance levels, and effect sizes). A subset of items relevant to Psychology Research Design and Statistics are presented here and only include students classified as seniors. In terms of Academic and Intellectual Experiences, UT Arlington students reported more instances of writing at least two drafts of a paper as well as feeling as though they were working harder to reach the expectations of instructors' when compared to the other groups. UT Arlington students reported fewer instances of working outside of class with other students on assignments and reported talking to faculty or advisors about future plans less than other groups. Mental Activities, the second set of NSSE items, include analyzing, synthesizing,

making judgments, and applying information learned in the current school year in their courses. There were no significant differences found between the groups in this category.

The preliminary findings have helped to define better the future directions for this research. The full scope of the project is both retrospective and prospective: First, students grades were tracked in four prerequisite courses (Introduction to Psychology, Computer Literacy, Algebra and English Composition) to understand if performance in these courses predicted performance in either of the two course sequences (i.e. PSYC 2441/2442 and PSYC 2443/2444). Next, the use of WebCT in PSYC 2443/2444 was evaluated for the ability of usage to predict performance of students in the integrated course. Finally, performance of the two cohorts who had completed either of the two-course sequences were examined to see if grades in those courses predicted outcomes in advanced electives, particularly in the advanced laboratory courses we offer in Cognitive Psychology, Social Psychology, and Neuroscience was evaluated.

Preliminary Study 2

The second study focused on prerequisite courses to determine their predictive value on PSYC 2441/2442 and 2443/2444 performance. The stand-alone courses PSYC 2441 Statistics and PSYC 2442 Experimental Psychology (cohort 1, N = 44) as well as PSYC 2443 and PSYC 2444 Research Design and Statistics I and II (cohort 2, N = 44), were used to discover the predictive value of the required prerequisites (Introduction to Psychology, Computer Literacy, Algebra and English Composition). Data were obtained, through the undergraduate advisor, via the MyMav system. The names of all pre-majors, all demographic variables, and all grades in all semesters were coded using a random number generator and all files were password protected. The data consisted of letter grades from Introduction to Psychology (Intro), Computer Literacy (Computer Lit), College Algebra (Algebra), and English Composition (English), the transfer status of each student for each prerequisite class, and GPA currently held by each student. Students were broken into three groups: non-transfer, transfer

(students who transferred three out of the four core classes), and other. The 'other' category consisted of individuals who took a CLEP test for credit or had an Advanced Placement waiver in the core class. Letter grades received a numerical code for statistical analyses (A=4, B=3, C=2, D=1). A subset of transfer students received an interpolated score by finding means for each of the core classes for the group and substituting those grades (since some range restriction may have occurred in these following analyses given the limits of the numerical coding).

When a series of simple linear regressions was calculated with separate pairs of variables it was found that Algebra and Intro were positively correlated with performance in 2441 while Algebra, Intro, and 2441 predicted performance in 2442 (See Table 1 for values). The results show that ~24% of variance in 2441 scores was due to the Algebra prerequisite, ~14% due to Computer Lit, and ~12% to Intro accounting for a total of 50% of the overall variance in 2441 grades. The variance in 2442 grades was due to ~11% of the Algebra prerequisite, ~12% to Intro and ~18% to performance in 2441 giving a total of 41% of variance accounted for. The same statistical procedure was used for 2443 and 2444 and it was found that Intro, Algebra, and English were positively correlated with performance in 2443 and Intro, Algebra, and 2443 were positively correlated with performance in 2444 (See Table 2 for values). The variance in 2443 performance was due to ~14% of the Algebra prerequisite and ~6% to English. The results for 2444 show that ~12% of variance was due to Algebra, ~12% due to Intro, and ~39% due to performance in 2443 giving a grand total of 63% of variance accounted for by prerequisite courses. Prerequisite courses had more effect on performance in the new sequence (2443/2444) compared to the old sequence (2441/2442).

The next step in the process was to determine if there were differences between performance in 2441/2442 and 2443/2444 depending on if students transferred in their prerequisite class credits from other colleges or took prerequisites from UT Arlington. It was found that transfer students and non-transfer students were not significantly different from one

another for 2441/2442 (Introduction to Psychology (F(1, 43) = .744, p = .393), Algebra (F(1,43) = 2.912, p = .095), English (F(1, 43) = .152, p = .698), and Computer Literacy (F(1, 43) = 2.225, p = .143)). But, for 2443/2444 a significant difference between the students who transferred their Introduction to Psychology course credit and those that did not was discovered: the transfer students had significantly higher letter grades than the non-transfer students, F(1, 43) = 4.980, p = .031. All other course comparisons were statistically uniform between transfer and non-transfer students (Algebra (F(1,43) = .524, p = .473), English (F(1, 43) = .262, p = .612), and Computer Literacy (F(1, 43) = .121, p = .729)).

Current Study

The current study evaluated performance of 2443/2444 students and the use of WebCT. The next step, after assessing time to graduate and the predictive power of prerequisite classes, was to see if the level of involvement in an online learning environment (i.e. WebCT) could predict grades. Grades were also used to predict upper-level lab performance. The PEW foundation internet usage survey (Pew Research Center, 2009), the Attitude Towards Computers Instrument (Shaft, Sharfman, & Wilfred, 2004), along with supplemental self report questions of learning style, were utilized as descriptors of internet use for the last 2443/2444 cohort.

CHAPTER 2

METHOD

Undergraduate psychology majors at UT Arlington who successfully completed PSYC 2443 and 2444, Research Design and Statistics I and II, during the Fall/Spring semesters of 2006-2007, 2007-2008, and 2008-2009 semesters were part of this study. At total of 44 students from each cohort were selected to be a part of this study (N=132). Individuals were required to have passed 2443 in both the lecture and the lab sections of the class (with 69.5% or higher in each) to continue on to 2444. It is a requirement of our majors to pass both semesters of the sequence with 69.5% or above in both lecture and lab to enter the higher level lab courses needed to complete the psychology degree.

2.2 Materials, Design, and Procedure

The "track students" feature was used to record the number of visits made to the following pages of WebCT:

- Home Page
- Discussion Posts (Read, Posted, and Follow-Up Posts)
- Mail
- MyGrades
- Other
- Content Pages (PowerPoints, APA information, Rubrics, Worksheets, Practice Questions, Other Miscellaneous Information)

WebCT was also utilized to obtain students' final grades in lecture, lab (along with the 3 major lab projects), overall final grade, and attendance. Surveys about internet usage (Pew Research Center, 2009) and technology anxiety (Attitude Towards Computers Instrument) (Shaft,

Sharfman, & Wilfred, 2004) were administered to the most recent cohort (Fall 2008/Spring 2009 students) to assess overall usage of the internet and anxiety about usage of the internet (See Appendixes C and D respectively, for survey questions). This survey also included self reports of learning styles, SAT, and ACT scores (See Appendix E). Another aspect of WebCT usage is the experience students gained over time in dealing with the online environment. Students' number of accesses of WebCT in 2443 and 2444 were used to assess efficiency of WebCT use.

The objective measures for this study were derived from data included in the "track students" feature along with attendance data and grades from the three major projects (2443: deconstructing the manuscript, manuscript, and portfolio; 2444: manuscript, proposal, and portfolio) were obtained via WebCT. All data were maintained in a password protected Excel spreadsheet with all names coded for privacy. First, descriptive statistics were computed to obtain measures of average tendencies and variance. Second, cross correlational analyses were performed on the objective measures of usage and attendance along with graded performance in lecture, lab and lecture-plus-lab composite scores. In addition, correlations were drawn between the above measures and performance in advanced electives. Third, group comparisons were made using t-tests, analysis of variance (ANOVA), and Tukey Post Hocs to determine the difference in WebCT usage between semesters to assess efficiency in utilization of WebCT. Lastly, regression analyses were used to determine if grades in the course sequence predicted performance in advanced electives and if WebCT usage accounted for variance in final grades.

The subjective (self report) measures of the data include the Pew Foundation internet usage survey, the ATCI, and Cyberguide goals self report. Descriptive statistics were computed to obtain the average self report measures of internet usage, attitudes toward computers, and Cyberguide goals.

2.3 Hypotheses

It was predicted that those students who interacted with one another and the GTAs (through discussion boards, email) on WebCT the most would have higher grades than those who refrained from interacting. Also, it was predicted that those who accessed Content (homepage, assignments, PowerPoints, handouts) with the greatest frequency on WebCT would have the highest grades as compared to those who accessed Content with less frequency. The final prediction was that students would access fewer pages and become more efficient WebCT users as time passes and as their time management and other skills improve over the course of each semester.

Finally, two tools, The Pew Research Center internet usage survey and the Attitude Towards Computer Inventory, were used to understand more about the characteristics of internet users by surveying the last 2443/ 2444 cohort of students. The Pew Research Center internet usage survey classifies individuals into nine different internet typologies: Digital Collaborator, Ambivalent Networker, Media Mover, Roving Node, Desktop Veterans, Drifting Surfer, Information Encumbered, Mobile Newbie, and Technology Indifferent (Pew Research Center, 2009) (See Appendix E for operational definitions of the internet use typologies).

The Attitude Towards Computer Inventory (ATCI) has been found to be a reliable scale to assess individuals' feelings toward computers (Shaft, Sharfman, & Wilfred, 2004). It takes into account three components to one's attitude: cognitive, behavioral, and affective. The ATCI scale, as reported in Shaft, Sharfman, & Wilfred's (2004) meta-analysis, boasts high internal consistency (average Cronbach alpha of .80; exceeding the .70 threshold as suggested by Nunnally & Bernstein, 1994), as well as high test-retest reliability (Cronbach alpha of .91 for first administration and .85 for the second on short interval test-retest; Cronbach alpha of .82 and .80 for long interval test-retest).

CHAPTER 3

RESULTS

Descriptive statistics were used to characterize the typical WebCT user and *t* tests and analysis of variance (ANOVA) were used to assess the grade differences and WebCT use differences for students in 2443 compared to when they were in 2444. Linear Regression analyses were used to predict Total, Lecture, and Lab grades based on communication (the number discussion posts made, the number of discussion posts read, and the number of mail page visits) and WebCT hits (Homepage, Organizer pages, Content pages, MyGrades, and Other page hits). The major grades in 2443 and 2444 (Project 1, Project 2, Project 3, Lecture, and Lab) were used as predictors of upper-level lab grades and descriptive statistics were used for surveys (Pew Foundation Internet Typologies, ATCI) given to the last cohort of 2443/2444.

3.1 The WebCT User

Research Design and Statistics I and II are WebCT assisted courses. Students were not required to log on to WebCT as part of their grade and due to that, the ranges of hits were quite varied; a true zero number of hits was possible. The typical 2443 student has higher overall hit counts (*M* = 483.77; SD=250.55; Range = 129-1673) than the typical 2444 student (*M*=436.61; *SD*=222.02; Range = 71-1416) over the course of the semester. In general, 2443 students were accessing various pages on average of 32.25 times a week whereas 2444 students were accessing various WebCT pages on average of 27.29 per week. Students in 2443 spent more time under the Communication tools page reading and posting on the discussion boards and checking mail (Posts: M = 1.77; *SD*=3.58; Range = 0-18; Posts read: *M*=106.61; *SD*=82.83; Range = 0-280; Mail: *M* = 23.49; *SD*=23.92; Range = 0-169) compared to 2444 students (Posts: *M* = 0.71; *SD*=1.54; Range = 0-9; Posts read: *M*=49.77; *SD*=36.22; Range = 0-102; Mail: *M* = 18.09; *SD*=16.04; Range = 0-117). When in 2443, students spent

more time on the Homepage (*M*=115.74; *SD*=74.72; Range = 17-576) than when in 2444 (*M*=79.40; *SD*=55.31; Range = 29-553) and more time checking their grades (*M*=40.27; *SD*=26.75; Range = 5-193) than when in 2444 (*M*=35.87; *SD*=24.13; Range = 2-192). The typical 2444 student clicked most on Organizer pages (2444: *M*=79.40; *SD*=55.31; Range = 15-432; 2443: (*M*=56.04; *SD*=41.51; Range = 6-351) looking for Content instead of checking grades, clicking on other links, or posting and reading the discussion boards. See Table 3 for 2443 and Table 6 for 2444 descriptive statistics for grades and WebCT Hits.

3.2 Grade Differences between 2443 and 2444

One-way ANOVAs were used to evaluate differences in grades from semester to semester. For 2443, there were significant differences in grades for Project 1, $F(2,129) = 3.498$, $p = .033$), Lecture grades, $F(2,129) = 4.138$, $p = .017$), and Lab grades, $F(2,129) = 7.153$, $p = .001$). No other significant differences were found. For 2444, there were significant differences for Lab Attendance, $F(1,86) = 4.511$, $p = .037$), Lecture grade, $F(2,129) = 7.522$, $p = .001$), and Total grade, $F(2,129) = 5.837$, $p = .004$). See Table 4 for the ANOVA and Table 5 for Post-Hoc tests for 2443 and Table 7 for the ANOVA and Table 8 for Post-Hoc tests for 2444.

Dependent *t*-tests were used for all grades and WebCT usage data to test the differences in students' performance and WebCT usage from 2443 to 2444. There was a significant difference for Project 1 $t(131) = 2.909$, $p = .004$), with students in 2443 performing significantly better on the project (M=.9087) than in 2444 (M=.8672). A significant difference was also found for the Total grade $t(131) = -2.365$, $p = .020$), with Total grades being significantly higher for students enrolled in 2444 (M=.8715) than when they were enrolled in 2443 (M=.8573). No significance differences were found for all other grade comparisons.

3.3 WebCT Communication as a Predictor of Performance

Regression analyses were conducted using the number of discussion posts made, the number of discussion posts read, and the mail page hits (Communication) to predict grades for 2443 and 2444 (Total, Lecture, and Lab). Taken together, Communication, accounted for a

statistically significant amount of the variance in Total grades (the lecture-plus lab composite) for 2443 [R^2 = .085 F(3, 135) = 3.95, p = .01], Lecture grades for 2443 [R^2 = .099 F(3, 131) = 4.663, p = .004], as well as the Lab grades in 2443 [R^2 = .064 F(3, 131) = 2.905, p = .037]. Significance tests of the regression coefficients for Total grade indicated that the number of discussion posts read (β = .041, t = .432, p = .666) was not a significant predictor of Total grade in the model. The number of mail page hits was negatively related with Total grade (β = -.279, t = -2.949, p = .004), whereas total number of posts was positively related to Total grade (β = .238, t = 2.491, p = .014). Significance tests of the regression coefficients for Lecture grade indicated that the number of discussion posts read (β = -.091, t = -.965, p = .336) was not a significant predictor of Lecture grade in the model. The number of mail page hits was negatively related with Lecture grade (β = -.283, t = -3.008, p = .003), whereas total number of posts was positively related to Lecture grade (β = .253, t = 2.667, p = .009). Significance tests of the regression coefficients for Lab grade indicated that taken alone, the number of total posts made (β = .144, t = 1.482, p = .141), the number of discussion posts read (β = .183, t = 1.904, p = .059), and the number of mail page hits (β = -.184, t = -1.926, p = .056) were not significant predictors in the model

Though communication was a predictor for 2443 grades, it was not a significant predictor for all three 2444 grades: Total [R^2 = .034 F(3, 131) = 1.480, p = .223], Lecture [R^2 = .031 F(3, 131) = 1.384, p = .251], and Lab [R^2 = .042 F(3, 131) = 1.876, p = .137]. See Tables 9, 10, and 11 for standardized beta weights and Table 12 for correlation matrices for all 2443 grades and Communication factors. See Tables 14, 15, and 16 for standardized beta weights and Table 17 for correlation matrices for all 2444 grades and Communication factors.

3.4 WebCT Usage as a Predictor of Grades

Regression analyses were conducted using the number of Homepage hits, Organizer page hits, Content page hits, MyGrade page hits, and Other page hits (WebCT Hits) to predict grades for 2443 and 2444 (Total, Lecture, and Lab). For 2443, WebCT Hits did not account for

a significant amount of the variance in Total grades [R^2 = .022 F(5, 131) = .579, p = .716] or Lecture grade [R^2 = .015 F(5, 131) = .386, p = .858]. However, WebCT hits did account for a statically significant amount of the variance seen in the Lab portion of the grades [R^2 = .109 F(5,131) = 3.073, p = .012]. Significance tests of the regression coefficients indicated that the number of Other page hits (β = .207, t = 2.172, p = .032) was the only significant predictor of Lab grade in the model See Tables 9, 10, and 11 for standardized beta weights and Table 13 for correlation matrices for all 2443 grades and WebCT Hits.

In contrast, for 2444, WebCT Hits accounted for a statistically significant amount of the variance for all three grades: Total [R^2 = .098 F(5, 131) = 2.739, p = .022], Lecture [R^2 = .101 F(5, 131) = 2.829, p = .019], and Lab [R^2 = .094 F(5, 131) = 2.604, p = .028]. Significance tests of the regression coefficients for Total grade indicated that the number of Other page hits (β = .192, t = 2.021, p = .045) was a significant predictor in the model and Content hits (β = -.318, t =- 2.731, p = .007) was significant and negatively related to Total grade. Significance tests of the regression coefficients for Lecture grade indicated that the Content hits (β = -.392, t = -3.369, p = .001) was the only significant predictor in the model and was negatively related to Lecture grade. And finally, for Lab grade, it was found that Other page hits (β = .207, t = 2.172, p = .032) was the only significant predictor in the model. See Tables 14, 15, and 16 for standardized beta weights and Table 18 for correlation matrices for all 2444 grades and WebCT Hits.

3.5 WebCT Users Became more Efficient Over Time

It was found that students were accessing WebCT significantly more often (t(131) = -14.055, p = .000), as measured by Total Hits, in 2443 (M = 483.7727) when compared to their enrollment in 2444 (M=436.6061) (See Figures 1-3 for Hits by letter grades and semesters). There was a significant difference in Homepage hits, t(131) = -4.071, p < .001, and Organizer page hits, t(131) = -5.829, p < .001. Students were accessing the Homepage and Organizer pages in 2444 (M = 138.2652; M = 79.4015) significantly more often than when in 2443 (M =

115.7424; M = 56.1379) but no significant difference was seen between the classes in Content page hits. There was a significant difference for MyGrades page hits, $t(131) = 2.862$, $p = .005$, as well as for Other page hits, $t(131) = 6.596$, $p < .001$. Students accessed the MyGrades page with a significantly higher frequency in 2443 (M=40.2652) than when in 2444 (M=35.8712). In addition, the Other pages were accessed significantly more often by students in 2443 (M=24.8939) than when in 2444 (M=15.0530).

Communication was measured by students' usage of the Discussion board posts and the number of articles read and number of Mail accesses. Students read significantly more discussion board posts in 2443 (M=106.6061) than when in 2444 (M=49.7727) ($t(131) = 9.617$, $p < .001$) and posted more in 2443 (M=1.7727) than in 2444 (M=.7121) ($t(131) = 4.075$, $p < .001$). The numbers of Mail accesses were significantly higher for 2443 students (M=23.4924) than for 2444 students (M=18.0985), $t(131) = 2.735$, $p = .007$.

3.6 Grades as a Predictor of Upper-Level Lab Grades

Students in 2443 Fall 2008 and 2444 Spring 2009 were excluded in the following linear regression analysis due to lack of upper level lab grades. (They had not been out of the Research Design and Statistics courses long enough to have taken upper level labs.) The remaining students (n = 56) examined were sorted based on the number of lab courses taken; those who had less than two upper level labs were not included in the analysis. Those who had two or more upper level lab grades were coded (A=4, B=3, C=2, D=1) and two of their possible five lab grades were randomly chosen and a composite score was calculated. The three major projects, Lab grade, and Lecture grade were found to account for a statically significant portion of the variance of upper-level lab grades for both 2443 [$R^2 = .281$ $F(5, 55) = 3.911$, $p = .005$] and 2444 [$R^2 = .207$ $F(5, 55) = 2.612$, $p = .036$]. See Tables 19-22 for beta weights and correlations for all regression analyses.

3.7 Internet Usage and Attitudes Surveys

Students from 2444 in the Spring 2009 semester participated in an anonymous WebCT based survey and answered questions about their internet usage and their feelings on computers. Eighty three percent (n=51) of the 62 students who participated in the Pew Foundation internet usage survey fell into the 3 internet usage typologies, Digital Collaborator, Ambivalent Networker, and Media Mover, that utilize Information and Communication Technology (ITC) the most. The remaining 11% fell into the Roving Node (n=4), Desktop Veteran (n=1), Drifting Surfer (n=4), and Information Encumbered (n=2) typologies. No responses were found for the Technology Indifferent and Mobile Newbies typologies (See Figure 4). The Pew foundations national results (2009) have a total of 22% that fall into the 3 typologies that use ITC the most. Roving Nodes make up 9%, Mobile Newbies 8%, Desktop Veterans 13%, Drifting Surfers 14%, Information Encumbered 10%, Technology Indifferent 10%, and finally 14% are considered off the network. See Table 23 for a side by side comparison of the 2443/2444 cohort and national sample percentages. For means and standard deviations of the ATCI see Table 24 and for the Cyberguide goals means refer to Table 25. Students' self reported learning styles can be found in Figure 5.

CHAPTER 4

DISCUSSION

It is important to note that 2443 and 2444 are WebCT assisted courses and lecture and lab meeting times are not substituted for WebCT contact hours. It is not a requirement for students to utilize WebCT when enrolled in these courses. In fact, it is possible for a student never to use WebCT and still do well in the class. Students have several alternatives to WebCT. Students can take notes in class without printing out the lecture or lab notes, they can attend every class to receive homework and other handouts, or they can obtain any materials missed from fellow classmates. Though grades can only be posted on WebCT (emailing grades is against UT Arlington policy) students can check their grades by attending office hours with the professor or their TA. Due to the fact that WebCT is optional, it is enlightening that students access it as often as they do and that the number of hits remained uniform from semester to semester. One plausible outcome of this project is that WebCT assistance promoted asynchronous learning via promoting asynchronous student engagement. Thus, WebCT assisted courses may be a valuable means to supplement other active learning activities that occur in lecture halls and laboratories over the course of the semester. At the very least, the instructional team can confirm whether or not and to what extent students are attending to course materials.

Students in 2443 participated more in online discussions and used the email function more than when in 2444. Students spent more time discussing the course, looking for help on projects, and asking where to find information than they did in 2444. It is possible that by the time students reached 2444, they felt more comfortable with the course as well as more comfortable navigating WebCT. Another interpretation is that 2444 students may have become

more efficient, or more purposeful in using WebCT. If, as suggested by Heffner and Cohen (2005), using WebCT correlates with grades it might be beneficial to encourage students in 2444 (and other courses) to utilize the discussion board more often to discuss course work and related information.

The current study's limitations include the lack of a true "control" group. Research Design and Statistics has used WebCT since its development and therefore does not have a comparable class to examine. WebCT's track student feature only shows dates of access and does not give the amount of time spent on any given page and Content pages are the only items that can be broken down by date of access; other items only show a hit count. This study is retrospective and therefore only allowed for the analysis of group differences and not individual differences. There was no pretesting for self-report measures (Pew Foundation internet survey and the ATCI) and all self-report measures were done on an anonymous basis. Strengths of this study include the large sample size and the use of more than one group of students. The three years of courses served as a sort of internal replication from semester to semester in evaluation of the multiple dimensions of WebCT usage. The teaching team was consistent from semester to semester (instructor and lab coordinator) and therefore has been similar in content and preparation over the years.

4.1 Grade Differences between 2443 and 2444

It was expected that grades would fluctuate between semesters due to a change in graduate teaching assistants, but as seen in this study, grades remained mostly stable across the course of semesters and years of the 2443/2444 sequence. Another factor that may have affected grades could be due to subtle changes in grading rubrics and exam questions. Rubrics were tweaked each year to make grading easier and more concise. Though exams were not returned to the students each year to prevent circulation to upcoming students, questions were changed and added.

4.2 WebCT Communication as a Predictor of Performance

Total grades for 2443 accounted for only about 9% of the variance in the model. Taken as a whole, Communication factors were predictive of Total grade performance as well as Lecture performance. This relationship suggests that the number of times students visited the Mail page, the lower their grade. However, the more Discussion posts students had, the higher their grade, and the number of posts read, taken alone, did not contribute to the prediction of Total grades or Lecture grades. All Communication factors for Lab grade prediction, taken together, accounted for only 6.4% of the variance, but none of the factors alone contributed to the Lab grades. Unfortunately, for 2444, none of the Communication variables were able to predict performance in Lecture, Lab, or Total grades.

4.3 WebCT Usage as a Predictor of Grades

In 2443, only the Lab grade was predicted by WebCT Hits. About 11% of the variance accounted for in Lab grades was due to the different possible page hits. Only Other page hits held a positive relationship to Lab grades, the more times students clicked on the Other pages, the higher their grade. For 2444, WebCT hits accounted for about 10% of the variance in Total grades. The direction of the relationship suggests that the more times students clicked on Content, the lower their total grades, while Other page hits were positively related to Total grades. For Lecture grades, the model as a whole accounted for about 10% of the variance with Content hits being negatively related to grades. While, in Lab, 9.4% of the variance was accounted for, only Other page hits, taken alone, contributed to the Lab grades. The more students clicked on Other pages, the higher their grades.

4.4 WebCT Users Became more Efficient Over Time

Students in 2443 were utilizing WebCT pages differently compared to how they used WebCT in 2444. Students in 2443 had higher overall hits than when in 2444, but were accessing Homepage and Organizer pages less often. Students in 2443 were frequenting the MyGrades page, Other pages, and Discussion boards. In 2443, students were more anxious to

check their grades and often, whereas in 2444, they were accustomed to the time schedule of posting grades. Students in 2443 also spent more time clicking on Other pages (links found on the bottom of the WebCT Homepage such as the UTA library website and WebCT help links) than in 2444. By 2444, most students had already explored links on WebCT that were not course related and therefore had fewer Other page hits during that semester. Students in 2443 accessed WebCT mail more often, posted more often on the discussion boards, and read more discussion posts than when in 2444. By the second semester, students had higher hit counts on the Homepage and Organizer pages then when they were in 2443. By the second semester they knew where to click in order to find the content needed for lecture and lab materials, though the number of Content page hits were not different between the two semesters, it is clear that students in 2444 knew exactly what to look for to find the Content and did not click on other pages in exploration of WebCT features.

4.5 Grades as a Predictor of Upper-Level Lab Grades

As an extension of Preliminary Study 2, the grades of students were used as predictors of upper-level lab grades. The Research Design and Statistics courses form a stepping stone into the upper-level courses. These classes train students to think like scientists and learn the mechanics of psychological experimentation, the basics of writing manuscripts and proposals, and good organizational skills. These skills must be carried over into upper-level labs where more specific skill sets are learned (i.e. Social, Cognitive, and Neuroscience). Students in those courses are expected to have a basic understanding of research and writing and should be able to take their knowledge to the next step. Once in the upper-level labs, students create their own research projects, collect data, and present results at an undergraduate poster session as part of their grade. Overall performance in 2443 and 2444 are good predictors of how students will fare in those classes accounting for 28% and 21% of the variance, respectively.

4.6 Internet Usage and Attitudes Surveys

As evidenced by the Pew Foundation internet usage study, students were familiar with the use of computers and used them in several ways. The internet is a form of networking, collaboration, and media information that most students seem to use effectively. Since most businesses, universities, and social networking have moved to the digital world, it makes sense that the majority of students fell into the categories that utilize ITC the most (Digital Collaborator, Ambivalent Networker, and Media Mover). The ATCI means also reflected the movement into the digital world showing positive attitudes towards computers on all items. Computers are seen as important pieces of life and are almost a requirement in today's society.

4.7 General Discussion and Future Directions

There are several reasons why WebCT is a valuable tool. Having materials and handouts online results in less paper usage and therefore less cost to universities. In addition, revising materials and making changes to posted items is quick and easy. Also, grades can be posted for large classes without confidentiality concerns, and WebCT allows instructors to "track students" (Heffner & Cohen, 2005). Heffner and Cohen's 2005 study suggests that if future studies obtain the same or similar findings in that WebCT usage does positively correlate with high grades, then the use of the "track students" feature could be utilized to send individual users periodic updates. This would include those who need to increase their WebCT participation and also to commend those who have excellent participation. Unfortunately, in this study, grades were not positively correlated with WebCT use and do not support Heffner and Cohen's suggestion of feedback for WebCT use.

An argument can be made that students who are good learners will perform well in courses and utilize WebCT effectively precisely because they are good learners. This is similar to the "good language learner" theory, in that some individuals have better learning strategies than others (Rubin, 1975). Rubin suggests that teachers may help other students improve by teaching them productive learning strategies already utilized by successful learners. So again,

the idea of tracking students who are successful in the 2443/2444 course and efficient WebCT users and passing along that information to other students might be beneficial to their progress in the sequence.

This study is interesting because it allowed for the analysis of the same groups of students over the course of two semesters. The ability to track their progress of WebCT familiarization and use is fascinating in that one can see the shift of use over time. At first, students spent time "fishing around" WebCT, finding out what type of content was available to them, as well as spending time communicating with their new classmates and figuring out the course together. By the second half of the sequence, it was apparent that students tended to "find their niche" and spent time on the pages that directed them to the content of the course. They had figured out the "flow" of WebCT, that is, when Content and grades were posted.

The current project yielded some interesting findings that have not been reported previously, which has stimulated some additional thinking about technology assistance in the classroom. Three areas for future research are described below.

In future work, it may be valuable to compare prospectively, a WebCT-assisted course with a similar course not assisted by WebCT. Alternatively, one could compare two courses with different instructional teams to see if different WebCT assistance produces different passing rates or overall grade performance. In such a prospective approach, it would be important to gain some baseline measures of computer literacy, prior WebCT usage, or typology of use. Pre- and post-course measures would better describe the student population and perhaps lead to the development of other pedagogies. For example, since 2443 students demonstrated their engagement through communication, it may be wise to include a required discussion posting in this course.

A second area of research is the promise that WebCT holds for studying individual differences in WebCT usage and engagement. WebCT may be useful for predicting behaviors of those whose performance is marginal or to follow those students who eventually fail or

become attrition statistics for other reasons. Of course, early intervention through the use of the "track students" function may be the best way to encourage students to be actively involved in their own learning. With such interventions, the typical office hour meeting can be held individually and asynchronously via the privacy that WebCT email affords. This may lead to a lessening of the students' repeating of a course and to better graduation rates.

Thirdly, the novice users in 2443 who so often contacted Other pages suggest that WebCT may act as a gateway to the other resources on the campus such as the library and IT. We may wish to re-think our orientation for students, especially transfer students whose primary contact with the university occurs in a WebCT class. Even the "grade anxiety" shown by student contacts with the MyGrades page during 2443 could help us refer students to the appropriate resources on campus to cope with the cultural adjustment from a two-year school to a four-year program. An orientation plan for undergraduates could be coupled with an orientation for the new TAs who may not be familiar with UT Arlington or the WebCT environment. Teaching assistants may improve their teaching skills as a result of interacting with students and other TAs in the WebCT environment. Again, pre- and post-tests would help us evaluate the efficacy of orientation via WebCT.

APPENDIX A

APA CYBERGUIDE GOALS: SELF ASSESSMENT

Name **Self Assessment in PSYC 2444** **Spring 2008**

Once we have reviewed the data, this assessment form will be returned to you so that you may include it in your portfolio. Objectives were selected from the APA Cyberguide that you received at the beginning of this course.

Using the following scale, how well do you feel you met some of the key objectives of this course?
0 = I did not meet the objective.
1 = I met the objective but I need additional experience.
2 = I met the objective fairly well.
3 = I met the objective very well.

Goal 1: Knowledge Base of Psychology

Demonstrate familiarity with the major concepts, theoretical perspectives, empirical findings, and historical trends in psychology.

_____Characterize the nature of psychology as a discipline.
_____Demonstrate knowledge and understanding representing appropriate breadth and depth in selected content areas of psychology: theory and research representing general domains, the history of psychology, relevant levels of analysis, overarching themes, and relevant ethical issues.

Comments:

Goal 2: Research Methods in Psychology

Understand and apply basic research methods in psychology, including research design, data analysis, and interpretation

_____Explain different research methods used by psychologists.
_____Describe how various research designs address different types of questions and hypotheses.
_____Articulate strengths and limitations of various research designs.
_____Distinguish the nature of designs that permit causal inferences from those that do not.
_____Evaluate the appropriateness of conclusions derived from psychological research.
_____Interpret basic statistical results.
_____Distinguish between statistical significance and practical significance.

_____Describe effect size and confidence intervals.
_____Evaluate the validity of conclusions presented in research reports.
_____Design and conduct basic studies to address psychological questions using appropriate research methods.
_____Locate and use relevant databases, research, and theory to plan, conduct, and interpret results of research studies.
_____Formulate testable research hypotheses, based on operational definitions of variables.
_____Select and apply appropriate methods to maximize internal and external validity and reduce the plausibility of alternative explanations.
_____Collect, analyze, interpret, and report data using appropriate statistical strategies to address different types of research questions and hypotheses.
_____Recognize that theoretical and sociocultural contexts as well as personal biases may shape research questions, design, data collection, analysis, and interpretation.
_____Follow the APA Code of Ethics in the treatment of human and nonhuman participants in the design, data collection, interpretation, and reporting of psychological research.
_____Generalize research conclusions appropriately based on the parameters of particular research methods.
_____Exercise caution in predicting behavior based on limitations of single studies.
_____Recognize the limitations of applying normative conclusions to individuals.
_____Acknowledge that research results may have unanticipated societal consequences.
_____Recognize that individual differences and sociocultural contexts may influence the applicability of research findings.

Comments:

Goal 3: Critical Thinking Skills in Psychology

Respect and use critical and creative thinking, skeptical inquiry, and, when possible, the scientific approach to solve problems related to behavior and mental processes

_____Use critical thinking effectively.
_____Engage in creative thinking.
_____Use reasoning to recognize, develop, defend, and criticize arguments and other persuasive appeals.
_____Approach problems effectively.

Comments:

Goal 6: Information and Technological Literacy

Demonstrate information competence and the ability to use computers and other technology for many purposes

_____Demonstrate information competence at each stage in the following process: formulating a researchable topic, choosing relevant and evaluating relevant resources, and reading and accurately summarizing scientific literature that can be supported by database search strategies
_____Use appropriate software to produce understandable reports of the psychological literature, methods, and statistical and qualitative analyses in APA or other appropriate style, including graphic representations of data.
_____Use information and technology ethically and responsibly.
_____Demonstrate basic computer skills, proper etiquette, and security safeguards.

Comments:

Goal 9: Personal Development

Develop insight into their own and other's behavior and mental processes and apply effective strategies for self-management and self-improvement.

_____Reflect on their experiences and find meaning in them.
_____Apply psychological principles to promote personal development.
_____Enact self-management strategies that maximize healthy outcomes.
_____Display high standards of personal integrity with others.

Comments:

APPENDIX B

SUBSET OF 2008 NSSE ITEMS

SEE SUPPLIMENTAL FILE

APPENDIX C

PEW INTERNET & AMERICAN LIFE PROJECT

Question 1
Some people say they feel overloaded with information these days, considering all the TV news shows, magazines, newspapers, and computer information services. Others say they like having so much information to choose from. Do you feel overloaded, or do you like having so much information available?

- ☐ a. Feel Overloaded
- ☐ b. Like having so much information available

Question 2
Overall, do you think that computers and technology give people MORE control over their lives, LESS control over their lives, or don't you think it makes any difference?

- ☐ a. MORE control over their lives
- ☐ b. makes NO DIFFERENCE

Question 3
About how often do you go online from home? Several times a day, about once a day, 3-5 days a week, 1-2 days a week, every few weeks, or less often?

- ☐ a. Several times a day
- ☐ b. About once a day
- ☐ c. 3-5 days a week
- ☐ d. 1-2 days a week
- ☐ e. Every few weeks
- ☐ f. Less often

Question 4
As I read the following list of items, please tell me if you happen to have each one, or not. Do you have...?

- ☐ a. A laptop computer
- ☐ b. An iPod or other MP3 player
- ☐ c. A digital camera
- ☐ d. A video camera
- ☐ e. A Blackberry, Palm or other personal digital assistant

Question 5
Please tell me if you ever use your cell phone (or Blackberry or other device) to do any of the following things

- a. Send or receive text messages
- b. Take a picture

Question 6
Do you ever use the internet to get news online?

- a. Yes
- b. No

Question 7
Do you ever use the internet to watch a video on a video-sharing site like YouTube or GoogleVideo?

- a. Yes
- b. No

Question 8
Here's another short list of activities people sometimes do online. Please tell me whether you ever do each one, or not.

- a. Create or work on your own webpage
- b. Share something online that you created yourself, such as your own artwork, photos, stories or videos
- c. Post comments to an online news group, website, blog or photo site

Question 9
Please tell us if the following statement describes you very well, somewhat well, not too well or not at all: I like that cell phones and other mobile devices allow me to be more available to others

- a. Very well
- b. Somewhat well
- c. Not too well
- d. Not at all

Question 10
Please tell us if the following statement describes you very well, somewhat well, not too well or not at all: When I get a new electronic device, I usually need someone else to set it up or show me how to use it

- a. Very Well
- b. Somewhat Well
- c. Not too Well
- d. Not at All

Question 11
Please tell us if each of the following statement describes you very well, somewhat well, not too well or not at all. When I don't have my cell phone or access to the internet, it is really hard to get the information I need

- a. Very Well
- b. Somewhat Well
- c. Not too Well
- d. Not at All

Question 12
Please tell us if each of the following statement describes you very well, somewhat well, not too well or not at all. I believe I am more productive because of all of my electronic devices

- a. Very Well
- b. Somewhat Well
- c. Not too well
- d. Not at all

Question 13

How difficult would it be, if at all, to give up the following things in your life? Your television

- a. Very hard
- b. Somewhat hard
- c. not too hard
- d. not hard at all

Question 14
How difficult would it be, if at all, to give up the following things in your life? Your Cell Phone

- a. very hard
- b. somewhat hard
- c. not too hard
- d. not at all hard

Question 15
How difficult would it be, if at all, to give up the following thing in your life? the internet

- a. very hard
- b. somewhat hard
- c. not too hard
- d. not at all hard

Question 16
In the past 12 months, have you EVER accessed the internet from someplace other than from home or from work?

- a. yes
- b. no

Question 17
Have you ever created your own profile online that others can see, like on a social networking site like MySpace, Facebook or LinkedIn.com?

- a. yes
- b. no

Question 18
How much, if at all, has this communication and information device improved... a lot, some, only a little, or not at all? your ability to share your ideas and creations with others

- a. a lot
- b. some
- c. only a little
- d. not at all

Question 19
How much, if at all, has this communication and information device improved... a lot, some, only a little, or not at all? your ability to do your job

- ☐ a. a lot
- ☐ b. some
- ☐ c. only a little
- ☐ d. not at all

Question 20
How much, if at all, has this communication and information device improved... a lot, some, only a little, or not at all? your ability to learn new things

- ☐ a. a lot
- ☐ b. some
- ☐ c. only a little
- ☐ d. not at all

Question 21
How much, if at all, has this communication and information device improved... a lot, some, only a little, or not at all? your ability to keep in touch with friends and family

- ☐ a. a lot
- ☐ b. some
- ☐ c. only a little
- ☐ d. not at all

APPENDIX D

ATTITUDES TOWARDS COMPUTER INVENTORY

This questionnaire contains eight pairs of adjectives that are used to describe computers. Please circle the number that best reflects your opinion. Think of computers in general terms and do not dwell on each specific answer.

1.
    a. 1 – restrain creativity
    b. 2
    c. 3
    d. 4
    e. 5
    f. 6
    g. 7 – enhance creativity

2.
    a. 1 – helpful
    b. 2
    c. 3
    d. 4
    e. 5
    f. 6
    g. 7 – harmful

3.
    a. 1 – enjoyable to use
    b. 2
    c. 3
    d. 4
    e. 5
    f. 6
    g. 7 – frustrating to use

4.
    a. 1 – boring
    b. 2
    c. 3
    d. 4
    e. 5
    f. 6
    g. 7 – intriguing

5.
    a. 1 – a sound investment
    b. 2
    c. 3
    d. 4
    e. 5
    f. 6
    g. 7 – a waste of money
6.
    h. 1 – difficult to use
    i. 2
    j. 3
    k. 4
    l. 5
    m. 6
    n. 7 – easy to use
7.
    a. 1 – non-threatening
    b. 2
    c. 3
    d. 4
    e. 5
    f. 6
    g. 7 – threatening
8.
    h. 1 – decrease productivity
    i. 2
    j. 3
    k. 4
    l. 5
    m. 6
    n. 7 – increase productivity

APPENDIX E

SUPPLIMENTAL QUESTIONS: SELF REPORTS

Please report your learning style. Think back to 2443 when Dr. Mann had you complete the VARK survey. If you do not remember your learning style you may want to take the short survey again. http://www.vark-learn.com/english/page.asp?p=questionnaire

a. Visual
b. Aural
c. Read/write
d. Kinesthetic
e. Multimodal

APPENDIX F

PEW RESEARCH CENTER INTERNET USER TYPOLOGIES

Digital Collaborator

If you are a Digital Collaborator, you use information technology to work with and share your creations with others. You are enthusiastic about how Information and Communication Technology (ICTs) help you connect with others and confident in how to manage digital devices and information. For you, the digital commons can be a camp, a lab, or a theater group – places to gather with others to develop something new.

Ambivalent Networker

If you are a Ambivalent Networker, you have folded mobile devices into how you run your social life, whether though texting or social networking tools online. You also rely on ICTs for entertainment. At the same time – perhaps because of the volume of digital pings from others, you may sometime find all your connectivity to be intrusive. You are confident in your ability to troubleshoot your various information devices and services.

Media Mover

If you are a Media Mover, you have a wide range of online and mobile habits, and you are bound to find or create an information nugget, such as a digital photo, and pass it on. These social exchanges are central to your use of information and communication technology. Cyberspace, as a path to personal productivity or an outlet for creativity, is less more important to you.

Roving Node

If you are a Roving Node, you are an active manager of your social and work lives using their mobile device. You get the most out of basic applications – such as email or texting – and find them great for dealing with the logistics of your life and enhancing personal productivity. You are more of a hub for information flows than a source of digital content. You are heavily reliant on all their ICTs for communicating and gathering information.

Desktop Veterans

If you are a Desktop Veteran, you are a veteran online user who is content to use a high-speed connection and a desktop computer to explore the internet and stay in touch with friends. That places their cell phone and mobile applications in the background for you. In some ways, a Desktop Information Gather may appear to be tech-oriented, but from 2004. You might occasionally participate in the online commons, but you treat the cell phone as if it were equipped only with voice capability.

Drifting Surfer

If you are a Drifting Surfer, you are infrequent online user. When you use technology, it is for basic information gathering – perhaps looking for some news headlines. It wouldn't bother you to give up the internet or cell phone. Digital resources are not at the center of how you get information, keep in touch with people, or do your job.

Information Encumbered

If you are in the Information Encumbered group, you probably suffer from information overload and think taking time off from the internet is a good thing. You are firmly rooted in old media to get information. Although you may think modern gadgets are worthwhile ways to keep in touch with others, you do not credit the internet or cell phone with any improvement in personal productivity or how you do their job.

Mobile Newbie

If you are a Mobile Newbie, you might have gotten a cell phone fairly recently, and have quickly found that having one is a big plus. You like being more available to others and would not want to give it up. Online access is a different issue. You are not a frequent user of the internet at home, and you may not have a high level of confidence in your ability to deal with gadgets or negotiate your way through the internet.

Technology Indifferent

If you are Tech Indifferent, you are not a heavy internet user and, although you probably have a cell phone, you don't like its intrusiveness. You could easily do without modern gadgets and services. You may bristle at the amount of information swirling through modern society and are not likely to see digital information as a way to learn new things or be more productive in your life.

APPENDIX G

TABLES

Table 1 Correlations among Introduction to Psychology, College Algebra, English Composition, Computer Literacy, PSYC 2441, and PSYC 2442

		Intro	Algebra	English	CompLit	Psyc2441	Psyc2442
Intro	Pearson Correlation	1.000	.273	-.034	.413**	.345*	.356*
	Sig. (2-tailed)		.073	.827	.005	.022	.018
	N	44	44	44	44	44	44
Algebra	Pearson Correlation	.273	1.000	-.078	.036	.361*	.318*
	Sig. (2-tailed)	.073		.613	.817	.016	.036
	N	44	44	44	44	44	44
English	Pearson Correlation	-.034	-.078	1.000	.042	.073	.092
	Sig. (2-tailed)	.827	.613		.784	.637	.551
	N	44	44	44	44	44	44
CompLit	Pearson Correlation	.413**	.036	.042	1.000	.197	.184
	Sig. (2-tailed)	.005	.817	.784		.199	.231
	N	44	44	44	44	44	44
Psyc2441	Pearson Correlation	.345*	.361*	.073	.197	1.000	.417**
	Sig. (2-tailed)	.022	.016	.637	.199		.005
	N	44	44	44	44	44	44
Psyc2442	Pearson Correlation	.356*	.318*	.092	.184	.417**	1.000
	Sig. (2-tailed)	.018	.036	.551	.231	.005	
	N	44	44	44	44	44	44

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

Table 2 Correlations among Introduction to Psychology, College Algebra, English Composition, Computer Literacy, PSYC 2443, and PSYC 2444

		Intro	Algebra	English	CompLit	Psyc2443	Psyc2444
Intro	Pearson Correlation	1.000	.322*	.219	.079	.373*	.340*
	Sig. (2-tailed)		.033	.154	.612	.013	.024
	N	44	44	44	44	44	44
Algebra	Pearson Correlation	.322*	1.000	.203	.151	.373*	.426**
	Sig. (2-tailed)	.033		.187	.327	.013	.004
	N	44	44	44	44	44	44
English	Pearson Correlation	.219	.203	1.000	.174	.352*	.163
	Sig. (2-tailed)	.154	.187		.257	.019	.289
	N	44	44	44	44	44	44
CompLit	Pearson Correlation	.079	.151	.174	1.000	.044	-.024
	Sig. (2-tailed)	.612	.327	.257		.775	.875
	N	44	44	44	44	44	44
Psyc2443	Pearson Correlation	.373*	.373*	.352*	.044	1.000	.623**
	Sig. (2-tailed)	.013	.013	.019	.775		.000
	N	44	44	44	44	44	44
Psyc2444	Pearson Correlation	.340*	.426**	.163	-.024	.623**	1.000
	Sig. (2-tailed)	.024	.004	.289	.875	.000	
	N	44	44	44	44	44	44

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

Table 3 Descriptive Statistics for 2443 Grades and WebCT Hits

						95% Confidence Interval for Mean	
		N	Mean	Std. Deviation	Std. Error	Lower Bound	Upper Bound
Project 1	Fa06	44	0.9409	0.0695	0.0105	0.9198	0.9620
	Fa07	44	0.8780	0.1129	0.0170	0.8437	0.9123
	Fa08	44	0.9071	0.1409	0.0212	0.8643	0.9499
	Total	132	0.9087	0.1138	0.0099	0.8891	0.9283
Project 2	Fa06	44	0.8903	0.1372	0.0207	0.8486	0.9320
	Fa07	44	0.8260	0.1493	0.0225	0.7806	0.8714
	Fa08	44	0.8685	0.1363	0.0205	0.8270	0.9099
	Total	132	0.8616	0.1425	0.0124	0.8371	0.8861
Project 3	Fa06	44	0.9966	0.0167	0.0025	0.9915	1.0017
	Fa07	44	0.9847	0.0598	0.0090	0.9665	1.0029
	Fa08	44	0.9767	0.0556	0.0084	0.9598	0.9936
	Total	132	0.9860	0.0485	0.0042	0.9776	0.9943
Lab Attendance	Fa06	0	0.0000	0.0000	0.0000	0.0000	0.0000
	Fa07	44	0.9125	0.1084	0.0163	0.8795	0.9455
	Fa08	44	0.8591	0.1792	0.0270	0.8046	0.9136
	Total	88	0.8858	0.1497	0.0160	0.8541	0.9175
Lecture Attendance	Fa06	0	0.0000	0.0000	0.0000	0.0000	0.0000
	Fa07	44	0.9502	0.0840	0.0127	0.9246	0.9757
	Fa08	44	0.9773	0.0457	0.0069	0.9634	0.9912
	Total	88	0.9637	0.0686	0.0073	0.9492	0.9783
Lecture Grade	Fa06	44	0.7960	0.0709	0.0107	0.7744	0.8175
	Fa07	44	0.8398	0.0824	0.0124	0.8148	0.8649
	Fa08	44	0.8304	0.0708	0.0107	0.8089	0.8519
	Total	132	0.8221	0.0767	0.0067	0.8089	0.8353
Lab Grade	Fa06	44	0.9086	0.0470	0.0071	0.8943	0.9229
	Fa07	44	0.8635	0.0809	0.0122	0.8388	0.8881
	Fa08	44	0.9053	0.0542	0.0082	0.8888	0.9218
	Total	132	0.8925	0.0653	0.0057	0.8812	0.9037

Table 3 – *Continued*

Total Grade	Fa06	44	0.8523	0.0500	0.0075	0.8371	0.8675
	Fa07	44	0.8516	0.0732	0.0110	0.8294	0.8739
	Fa08	44	0.8679	0.0555	0.0084	0.8510	0.8847
	Total	132	0.8573	0.0604	0.0053	0.8469	0.8677
First Login	Fa06	44	3.3182	1.0515	0.1585	2.9985	3.6379
	Fa07	44	2.9318	1.6481	0.2485	2.4308	3.4329
	Fa08	44	1.5455	1.0665	0.1608	1.2212	1.8697
	Total	132	2.5985	1.4871	0.1294	2.3424	2.8545
Hits	Fa06	44	431.8636	205.1390	30.9259	369.4957	494.2316
	Fa07	44	525.5682	243.0873	36.6468	451.6629	599.4735
	Fa08	44	493.8864	292.2818	44.0631	405.0246	582.7482
	Total	132	483.7727	250.5538	21.8079	440.6315	526.9140
Post Read	Fa06	44	98.5909	73.0241	11.0088	76.3895	120.7923
	Fa07	44	120.1136	101.2961	15.2710	89.3168	150.9105
	Fa08	44	101.1136	70.8806	10.6856	79.5640	122.6633
	Total	132	106.6061	82.8285	7.2093	92.3444	120.8678
Original Posts	Fa06	44	0.3409	0.8337	0.1257	0.0874	0.5944
	Fa07	44	0.6364	1.2217	0.1842	0.2649	1.0078
	Fa08	44	0.3636	0.6503	0.0980	0.1659	0.5613
	Total	132	0.4470	0.9354	0.0814	0.2859	0.6080
Follow-up Posts	Fa06	44	0.8864	2.3249	0.3505	0.1795	1.5932
	Fa07	44	1.4318	3.1799	0.4794	0.4651	2.3986
	Fa08	44	1.6591	2.9566	0.4457	0.7602	2.5580
	Total	132	1.3258	2.8405	0.2472	0.8367	1.8149
Homepage	Fa06	44	98.6818	54.3720	8.1969	82.1512	115.2124
	Fa07	44	125.9318	62.2887	9.3904	106.9943	144.8693
	Fa08	44	122.6136	98.5927	14.8634	92.6387	152.5886
	Total	132	115.7424	74.7204	6.5036	102.8768	128.6081
Organizer	Fa06	44	50.6591	29.5477	4.4545	41.6758	59.6424
	Fa07	44	56.8636	35.9448	5.4189	45.9354	67.7918
	Fa08	44	60.5909	55.0726	8.3025	43.8473	77.3345
	Total	132	56.0379	41.5109	3.6131	48.8904	63.1854

Table 3 - *Continued*

Content	Fa06	44	71.8409	33.7521	5.0883	61.5793	82.1025
	Fa07	44	105.0227	44.5439	6.7153	91.4801	118.5653
	Fa08	44	101.2500	52.0461	7.8462	85.4265	117.0735
	Total	132	92.7045	46.2177	4.0227	84.7466	100.6625
Mail	Fa06	44	23.1818	21.6422	3.2627	16.6020	29.7616
	Fa07	44	26.8636	20.1074	3.0313	20.7504	32.9768
	Fa08	44	20.4318	29.1447	4.3937	11.5710	29.2926
	Total	132	23.4924	23.9221	2.0822	19.3734	27.6114
MyGrades	Fa06	44	43.6136	36.4202	5.4905	32.5409	54.6864
	Fa07	44	39.0682	20.6627	3.1150	32.7861	45.3502
	Fa08	44	38.1136	20.2257	3.0491	31.9645	44.2628
	Total	132	40.2652	26.7510	2.3284	35.6591	44.8712
Other	Fa06	44	19.9091	20.5266	3.0945	13.6684	26.1497
	Fa07	44	27.2273	29.1060	4.3879	18.3783	36.0763
	Fa08	44	27.5455	25.2204	3.8021	19.8778	35.2132
	Total	132	24.8939	25.2527	2.1980	20.5458	29.2420

Table 4 ANOVA Table for 2443 Grades and WebCT Hits

		Sum of Squares	df	Mean Square	F	Sig.
Project1	Between Groups	.087	2	.044	3.498	.033
	Within Groups	1.609	129	.012		
	Total	1.697	131			
Project2	Between Groups	.094	2	.047	2.367	.098
	Within Groups	2.566	129	.020		
	Total	2.661	131			
Project3	Between Groups	.009	2	.004	1.902	.153
	Within Groups	.299	129	.002		
	Total	.308	131			
Attendance Lecture	Between Groups	.063	1	.063	2.860	.094
	Within Groups	1.887	86	.022		
	Total	1.950	87			
Attendance Lab	Between Groups	.016	1	.016	3.534	.064
	Within Groups	.393	86	.005		
	Total	.409	87			
Lecture	Between Groups	.047	2	.023	4.183	.017
	Within Groups	.724	129	.006		
	Total	.771	131			
Lab	Between Groups	.056	2	.028	7.153	.001
	Within Groups	.503	129	.004		
	Total	.559	131			
Total	Between Groups	.007	2	.004	1.016	.365
	Within Groups	.471	129	.004		
	Total	.478	131			
First Login	Between Groups	76.470	2	38.235	23.129	.000
	Within Groups	213.250	129	1.653		
	Total	289.720	131			
Hits	Between Groups	199922.773	2	99961.386	1.607	.204
	Within Groups	8023890.409	129	62200.701		
	Total	8223813.182	131			

Table 4 - *Continued*

Posts Read	Between Groups	12182.015	2	6091.008	.886	.415
	Within Groups	886551.500	129	6872.492		
	Total	898733.515	131			
Original Posts	Between Groups	2.379	2	1.189	1.367	.259
	Within Groups	112.250	129	.870		
	Total	114.629	131			
Follow-up Posts	Between Groups	13.879	2	6.939	.858	.426
	Within Groups	1043.114	129	8.086		
	Total	1056.992	131			
Homepage	Between Groups	19452.470	2	9726.235	1.762	.176
	Within Groups	711938.773	129	5518.905		
	Total	731391.242	131			
Organizer	Between Groups	2215.106	2	1107.553	.639	.529
	Within Groups	223517.705	129	1732.695		
	Total	225732.811	131			
Content	Between Groups	29042.364	2	14521.182	7.470	.001
	Within Groups	250783.114	129	1944.055		
	Total	279825.477	131			
Mail	Between Groups	916.470	2	458.235	.798	.452
	Within Groups	74050.523	129	574.035		
	Total	74966.992	131			
MyGrades	Between Groups	760.061	2	380.030	.527	.592
	Within Groups	92985.659	129	720.819		
	Total	93745.720	131			
Other	Between Groups	1642.242	2	821.121	1.293	.278
	Within Groups	81896.273	129	634.855		
	Total	83538.515	131			

Table 5 Post-Hoc Tests for 2443 Grades and WebCT Hits

Dependent Variable	(I) Semester	(J) Semester	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Project 1	Fa06	Fa07	.06293*	0.02381	0.025	0.0065	0.1194
		Fa08	0.03381	0.02381	0.334	-0.0227	0.0903
	Fa07	Fa08	-0.02912	0.02381	0.442	-0.0856	0.0273
Project 2	Fa06	Fa07	0.06434	0.03007	0.086	-0.007	0.1356
		Fa08	0.02187	0.03007	0.748	-0.0494	0.0932
	Fa07	Fa08	-0.04247	0.03007	0.338	-0.1138	0.0288
Project 3	Fa06	Fa07	0.01193	0.01026	0.478	-0.0124	0.0363
		Fa08	0.01989	0.01026	0.132	-0.0045	0.0442
	Fa07	Fa08	0.00795	0.01026	0.719	-0.0164	0.0323
Lecture	Fa06	Fa07	-.04387*	0.01597	0.019	-0.0817	-0.006
		Fa08	-0.03445	0.01597	0.083	-0.0723	0.0034
	Fa07	Fa08	0.00943	0.01597	0.826	-0.0284	0.0473
Lab	Fa06	Fa07	.04516*	0.01331	0.003	0.0136	0.0767
		Fa08	0.00331	0.01331	0.967	-0.0283	0.0349
	Fa07	Fa08	-.04185*	0.01331	0.006	-0.0734	-0.0103
Total	Fa06	Fa07	0.00066	0.01288	0.999	-0.0299	0.0312
		Fa08	-0.01556	0.01288	0.450	-0.0461	0.015
	Fa07	Fa08	-0.01622	0.01288	0.421	-0.0468	0.0143
First Login	Fa06	Fa07	0.38636	0.27412	0.339	-0.2636	1.0363
		Fa08	1.77273*	0.27412	0.000	1.1228	2.4227
	Fa07	Fa08	1.38636*	0.27412	0.000	0.7364	2.0363
Hits	Fa06	Fa07	-93.70455	53.1724	0.186	-219.78	32.3711
		Fa08	-62.02273	53.1724	0.475	-188.098	64.053
	Fa07	Fa08	31.68182	53.1724	0.823	-94.3939	157.7575

Table 5 - *Continued*

Posts Read	Fa06	Fa07	-21.52273	17.67445	0.445	-63.4301	20.3847
		Fa08	-2.52273	17.67445	0.989	-44.4301	39.3847
	Fa07	Fa08	19	17.67445	0.531	-22.9074	60.9074
Original Posts	Fa06	Fa07	-0.29545	0.19888	0.301	-0.767	0.1761
		Fa08	-0.02273	0.19888	0.993	-0.4943	0.4488
	Fa07	Fa08	0.27273	0.19888	0.359	-0.1988	0.7443
Follow-up Post	Fa06	Fa07	-0.54545	0.60626	0.641	-1.9829	0.892
		Fa08	-0.77273	0.60626	0.412	-2.2102	0.6648
	Fa07	Fa08	-0.22727	0.60626	0.926	-1.6648	1.2102
Homepage	Fa06	Fa07	-27.25	15.83854	0.201	-64.8043	10.3043
		Fa08	-23.93182	15.83854	0.289	-61.4862	13.6225
	Fa07	Fa08	3.31818	15.83854	0.976	-34.2362	40.8725
Organizer	Fa06	Fa07	-6.20455	8.87462	0.764	-27.2469	14.8378
		Fa08	-9.93182	8.87462	0.504	-30.9742	11.1106
	Fa07	Fa08	-3.72727	8.87462	0.907	-24.7697	17.3151
Content	Fa06	Fa07	-33.18182*	9.40033	0.002	-55.4707	-10.893
		Fa08	-29.40909*	9.40033	0.006	-51.698	-7.1202
	Fa07	Fa08	3.77273	9.40033	0.915	-18.5161	26.0616
Mail	Fa06	Fa07	-3.68182	5.10808	0.752	-15.7935	8.4298
		Fa08	2.75	5.10808	0.853	-9.3616	14.8616
	Fa07	Fa08	6.43182	5.10808	0.421	-5.6798	18.5435
MyGrades	Fa06	Fa07	4.54545	5.72403	0.707	-9.0266	18.1175
		Fa08	5.5	5.72403	0.603	-8.0721	19.0721
	Fa07	Fa08	0.95455	5.72403	0.985	-12.6175	14.5266

Table 5 - *Continued*

Other	Fa06	Fa07	-7.31818	5.37187	0.364	-20.0553	5.4189
		Fa08	-7.63636	5.37187	0.333	-20.3735	5.1007
	Fa07	Fa08	-0.31818	5.37187	0.998	-13.0553	12.4189

*. The mean difference is significant at the 0.05 level.

Table 6 Descriptive Statistics for 2444 Grades and WebCT Hits

						95% Confidence Interval for Mean	
		N	Mean	Std. Deviation	Std. Error	Lower Bound	Upper Bound
Project 1	Sp07	44	0.8678	0.1215	0.0183	0.8309	0.9048
	Sp08	44	0.8775	0.1185	0.0179	0.8414	0.9135
	Sp09	44	0.8564	0.1569	0.0237	0.8087	0.9042
	Total	132	0.8672	0.1327	0.0116	0.8444	0.8901
Project 2	Sp07	44	0.8389	0.1191	0.0179	0.8027	0.8751
	Sp08	44	0.9011	0.1157	0.0174	0.8660	0.9363
	Sp09	44	0.8903	0.1633	0.0246	0.8406	0.9399
	Total	132	0.8768	0.1362	0.0119	0.8533	0.9002
Project 3	Sp07	44	0.9955	0.0211	0.0032	0.9890	1.0019
	Sp08	44	0.9807	0.0756	0.0114	0.9577	1.0037
	Sp09	44	0.9869	0.0436	0.0066	0.9737	1.0002
	Total	132	0.9877	0.0518	0.0045	0.9788	0.9966
Lab Attendance	Sp07	0	0.0000	0.0000	0.0000	0.0000	0.0000
	Sp08	44	0.8951	0.0997	0.0150	0.8648	0.9254
	Sp09	44	0.9143	0.1287	0.0194	0.8752	0.9535
	Total	88	0.9047	0.1149	0.0122	0.8804	0.9291
Lecture Attendance	Sp07	0	0.0000	0.0000	0.0000	0.0000	0.0000
	Sp08	44	0.9581	0.0803	0.0121	0.9336	0.9825
	Sp09	44	0.9860	0.0343	0.0052	0.9756	0.9964
	Total	88	0.9720	0.0630	0.0067	0.9587	0.9854
Lecture Grade	Sp07	44	0.8222	0.0710	0.0107	0.8006	0.8438
	Sp08	44	0.8235	0.0814	0.0123	0.7987	0.8482
	Sp09	44	0.8774	0.0758	0.0114	0.8543	0.9004
	Total	132	0.8410	0.0799	0.0070	0.8272	0.8548
Lab Grade	Sp07	44	0.8891	0.0624	0.0094	0.8701	0.9080
	Sp08	44	0.8963	0.0758	0.0114	0.8732	0.9193
	Sp09	44	0.9203	0.0742	0.0112	0.8978	0.9429
	Total	132	0.9019	0.0718	0.0062	0.8895	0.9142

Table 6 - *Continued*

Total Grade	Sp07	44	0.8556	0.0593	0.0089	0.8376	0.8737
	Sp08	44	0.8599	0.0695	0.0105	0.8387	0.8810
	Sp09	44	0.8989	0.0670	0.0101	0.8785	0.9192
	Total	132	0.8715	0.0678	0.0059	0.8598	0.8831
First Login	Sp07	44	6.8409	0.9135	0.1377	6.5632	7.1187
	Sp08	44	3.5455	1.0220	0.1541	3.2348	3.8562
	Sp09	44	6.0682	1.8850	0.2842	5.4951	6.6413
	Total	132	5.4848	1.9438	0.1692	5.1502	5.8195
Hits	Sp07	44	439.9318	218.9681	33.0107	373.3594	506.5042
	Sp08	44	382.3636	156.0291	23.5223	334.9265	429.8008
	Sp09	44	487.5227	268.7100	40.5096	405.8274	569.2180
	Total	132	436.6061	222.0205	19.3244	398.3778	474.8343
Post Read	Sp07	44	57.3636	40.9913	6.1797	44.9012	69.8261
	Sp08	44	36.2273	26.2987	3.9647	28.2317	44.2228
	Sp09	44	55.7273	36.6202	5.5207	44.5937	66.8608
	Total	132	49.7727	36.2166	3.1523	43.5368	56.0086
Original Posts	Sp07	44	0.1364	0.6321	0.0953	-0.0558	0.3285
	Sp08	44	0.1818	0.4952	0.0747	0.0313	0.3324
	Sp09	44	0.2045	0.5094	0.0768	0.0497	0.3594
	Total	132	0.1742	0.5456	0.0475	0.0803	0.2682
Follow-up Posts	Sp07	44	0.3409	1.0330	0.1557	0.0268	0.6550
	Sp08	44	0.5682	1.3364	0.2015	0.1619	0.9745
	Sp09	44	0.7045	1.2497	0.1884	0.3246	1.0845
	Total	132	0.5379	1.2132	0.1056	0.3290	0.7468
Homepage	Sp07	44	131.7273	79.2826	11.9523	107.6231	155.8314
	Sp08	44	124.8636	61.4448	9.2632	106.1827	143.5446
	Sp09	44	158.2045	111.2597	16.7730	124.3785	192.0306
	Total	132	138.2652	87.0287	7.5749	123.2802	153.2501
Organizer	Sp07	44	79.9773	44.2517	6.6712	66.5235	93.4310
	Sp08	44	68.6136	33.5685	5.0606	58.4079	78.8194
	Sp09	44	89.6136	77.5198	11.6865	66.0455	113.1818
	Total	132	79.4015	55.3119	4.8143	69.8777	88.9253

Table 6 - *Continued*

Content	Sp07	44	84.9318	40.1291	6.0497	72.7315	97.1322
	Sp08	44	92.5227	37.3435	5.6297	81.1693	103.8762
	Sp09	44	106.8636	56.4227	8.5060	89.7096	124.0177
	Total	132	94.7727	45.9852	4.0025	86.8548	102.6906
Mail	Sp07	44	23.7045	18.1807	2.7408	18.1771	29.2320
	Sp08	44	17.5227	18.4107	2.7755	11.9254	23.1201
	Sp09	44	13.0682	7.4939	1.1297	10.7898	15.3465
	Total	132	18.0985	16.0423	1.3963	15.3363	20.8607
MyGrades	Sp07	44	39.7045	33.1821	5.0024	29.6163	49.7928
	Sp08	44	31.9545	14.6398	2.2070	27.5036	36.4054
	Sp09	44	35.9545	20.6892	3.1190	29.6644	42.2446
	Total	132	35.8712	24.1321	2.1004	31.7161	40.0264
Other	Sp07	44	13.6136	13.6726	2.0612	9.4568	17.7705
	Sp08	44	12.3182	12.0633	1.8186	8.6506	15.9858
	Sp09	44	19.2273	15.8787	2.3938	14.3997	24.0548
	Total	132	15.0530	14.1757	1.2338	12.6122	17.4939

Table 7 ANOVA Table for 2444 Grades and WebCT Hits

		Sum of Squares	df	Mean Square	F	Sig.
Project 1	Between Groups	.010	2	.005	.273	.761
	Within Groups	2.297	129	.018		
	Total	2.307	131			
Project 2	Between Groups	.097	2	.049	2.687	.072
	Within Groups	2.332	129	.018		
	Total	2.429	131			
Project 3	Between Groups	.005	2	.002	.899	.409
	Within Groups	.347	129	.003		
	Total	.352	131			
Attendance Lecture	Between Groups	.008	1	.008	.613	.436
	Within Groups	1.140	86	.013		
	Total	1.148	87			
Attendance Lab	Between Groups	.017	1	.017	4.511	.037
	Within Groups	.328	86	.004		
	Total	.345	87			
Lecture	Between Groups	.087	2	.044	7.522	.001
	Within Groups	.748	129	.006		
	Total	.836	131			
Lab	Between Groups	.024	2	.012	2.339	.100
	Within Groups	.651	129	.005		
	Total	.675	131			

Table 7 - *Continued*

Total	Between Groups	.050	2	.025	5.837	.004
	Within Groups	.552	129	.004		
	Total	.602	131			
First	Between Groups	261.379	2	130.689	72.173	.000
	Within Groups	233.591	129	1.811		
	Total	494.970	131			
Hits	Between Groups	244015.561	2	122007.780	2.533	.083
	Within Groups	6213377.955	129	48165.721		
	Total	6457393.515	131			
Posts Read	Between Groups	12168.545	2	6084.273	4.916	.009
	Within Groups	159656.636	129	1237.648		
	Total	171825.182	131			
Original Posts	Between Groups	.106	2	.053	.176	.839
	Within Groups	38.886	129	.301		
	Total	38.992	131			
Follow-up Posts	Between Groups	2.970	2	1.485	1.009	.367
	Within Groups	189.841	129	1.472		
	Total	192.811	131			
Homepage	Between Groups	27276.652	2	13638.326	1.823	.166
	Within Groups	964917.068	129	7479.977		
	Total	992193.720	131			
Organizer	Between Groups	9723.879	2	4861.939	1.604	.205
	Within Groups	391057.841	129	3031.456		
	Total	400781.720	131			
Content	Between Groups	10916.227	2	5458.114	2.646	.075
	Within Groups	266100.955	129	2062.798		
	Total	277017.182	131			

Table 7 - *Continued*

Mail	Between Groups	2510.788	2	1255.394	5.190	.007
	Within Groups	31202.932	129	241.883		
	Total	33713.720	131			
MyGrades	Between Groups	1321.833	2	660.917	1.137	.324
	Within Groups	74966.977	129	581.139		
	Total	76288.811	131			
Other	Between Groups	1186.924	2	593.462	3.045	.051
	Within Groups	25137.705	129	194.866		
	Total	26324.629	131			

Table 8 Post-Hoc Tests for 2444 Grades and WebCT Hits

Dependent Variable	(I) Semester	(J) Semester	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Project 1	Sp07	Sp08	-0.00965	0.02845	0.939	-0.0771	0.0578
		Sp09	0.01136	0.02845	0.916	-0.0561	0.0788
	Sp08	Sp09	0.02102	0.02845	0.741	-0.0464	0.0885
Project 2	Sp07	Sp08	-0.06221	0.02866	0.08	-0.1302	0.0058
		Sp09	-0.05134	0.02866	0.177	-0.1193	0.0166
	Sp08	Sp09	0.01087	0.02866	0.924	-0.0571	0.0788
Project 3	Sp07	Sp08	0.01477	0.01106	0.378	-0.0114	0.041
		Sp09	0.00852	0.01106	0.722	-0.0177	0.0347
	Sp08	Sp09	-0.00625	0.01106	0.839	-0.0325	0.02
Lecture	Sp07	Sp08	-0.00126	0.01624	0.997	-0.0398	0.0372
		Sp09	-.05517*	0.01624	0.003	-0.0937	-0.0167
	Sp08	Sp09	-.05390*	0.01624	0.003	-0.0924	-0.0154
Lab	Sp07	Sp08	-0.0072	0.01515	0.883	-0.0431	0.0287
		Sp09	-0.03128	0.01515	0.101	-0.0672	0.0046
	Sp08	Sp09	-0.02408	0.01515	0.254	-0.06	0.0118
Total	Sp07	Sp08	-0.00423	0.01395	0.951	-0.0373	0.0288
		Sp09	-.04322*	0.01395	0.007	-0.0763	-0.0102
	Sp08	Sp09	-.03899*	0.01395	0.016	-0.0721	-0.0059
First	Sp07	Sp08	3.29545*	0.28689	0	2.6152	3.9757
		Sp09	.77273*	0.28689	0.022	0.0925	1.453
	Sp08	Sp09	-2.52273*	0.28689	0	-3.203	-1.8425
Hits	Sp07	Sp08	57.56818	46.7905	0.438	-53.3755	168.5119
		Sp09	-47.59091	46.7905	0.567	-158.535	63.3528
	Sp08	Sp09	-105.15909	46.7905	0.067	-216.103	5.7846

Table 8 - *Continued*

Read	Sp07	Sp08	21.13636*	7.50045	0.015	3.3522	38.9205
		Sp09	1.63636	7.50045	0.974	-16.1478	19.4205
	Sp08	Sp09	-19.50000*	7.50045	0.028	-37.2841	-1.7159
Original Post	Sp07	Sp08	-0.04545	0.11706	0.92	-0.323	0.2321
		Sp09	-0.06818	0.11706	0.83	-0.3457	0.2094
	Sp08	Sp09	-0.02273	0.11706	0.979	-0.3003	0.2548
Follow-up Post	Sp07	Sp08	-0.22727	0.25864	0.655	-0.8405	0.386
		Sp09	-0.36364	0.25864	0.341	-0.9769	0.2496
	Sp08	Sp09	-0.13636	0.25864	0.858	-0.7496	0.4769
Homepage	Sp07	Sp08	6.86364	18.43906	0.927	-36.8567	50.584
		Sp09	-26.47727	18.43906	0.326	-70.1976	17.2431
	Sp08	Sp09	-33.34091	18.43906	0.171	-77.0613	10.3795
Organizer	Sp07	Sp08	11.36364	11.73855	0.598	-16.4693	39.1966
		Sp09	-9.63636	11.73855	0.691	-37.4693	18.1966
	Sp08	Sp09	-21	11.73855	0.177	-48.833	6.833
Content	Sp07	Sp08	-7.59091	9.68316	0.714	-30.5504	15.3686
		Sp09	-21.93182	9.68316	0.064	-44.8913	1.0277
	Sp08	Sp09	-14.34091	9.68316	0.303	-37.3004	8.6186
Mail	Sp07	Sp08	6.18182	3.31582	0.153	-1.6802	14.0439
		Sp09	10.63636*	3.31582	0.005	2.7743	18.4984
	Sp08	Sp09	4.45455	3.31582	0.374	-3.4075	12.3166
MyGrades	Sp07	Sp08	7.75	5.13959	0.291	-4.4364	19.9364
		Sp09	3.75	5.13959	0.746	-8.4364	15.9364
	Sp08	Sp09	-4	5.13959	0.717	-16.1864	8.1864
Other	Sp07	Sp08	1.29545	2.97616	0.901	-5.7612	8.3522
		Sp09	-5.61364	2.97616	0.147	-12.6703	1.4431
	Sp08	Sp09	-6.90909	2.97616	0.056	-13.9658	0.1476

*. The mean difference is significant at the 0.05 level.

Table 9 Standardized Beta Weights for 2443 Communication Factors and WebCT Hits for Total Grades

	2443 Total Grade		
Variable	Standardized β	t	Sig.
Discussion Posts Read	.041	.432	.666
Mail Hits	-.279	-2.949	.004
Total Posts	.238	2.491	.014
Homepage	-.249	-1.414	.160
Organizer	.143	.988	.325
Content	-.017	-.140	.889
MyGrades	.103	.898	.371
Other	.087	.807	.421

Table 10 Standardized Beta Weights for 2443 Communication Factors and WebCT Hits for Lecture Grades

	2443 Lecture Grade		
Variable	Standardized β	t	Sig.
Discussion Posts Read	-.091	-.965	.336
Mail Hits	-.283	-3.008	.003
Total Posts	.253	2.667	.009
Homepage	-.069	-.391	.697
Organizer	.083	.574	.567
Content	.066	.553	.581
MyGrades	-.089	-.776	.439
Other	-.030	-.283	.778

Table 11 Standardized Beta Weights for 2443 Communication Factors and WebCT Hits for Lab Grades

	2443 Lab Grade		
Variable	Standardized β	t	Sig.
Discussion Posts Read	.183	1.904	.059
Mail Hits	-.184	-1.926	.056
Total Posts	.144	1.482	.141
Homepage	.182	.569	.571
Organizer	.035	.132	.895
Content	-.165	-1.413	.160
MyGrades	.037	.296	.768
Other	.207	2.172	.032

Table 12 Correlations among Communication Factors and 2443 Lecture, Lab, and Total Grades

		Lecture	Lab	Total	Read	Posts	Mail
Lecture	Pearson Correlation	1.000	.445**	.875**	-.096	.110	-.219*
	Sig. (2-tailed)		.000	.000	.275	.211	.011
	N	132	132	132	132	132	132
Lab	Pearson Correlation	.445**	1.000	.823**	.172*	.145	-.062
	Sig. (2-tailed)	.000		.000	.049	.097	.479
	N	132	132	132	132	132	132
Total	Pearson Correlation	.875**	.823**	1.000	.032	.148	-.173*
	Sig. (2-tailed)	.000	.000		.716	.090	.047
	N	132	132	132	132	132	132
Read	Pearson Correlation	-.096	.172*	.032	1.000	.393**	.368**
	Sig. (2-tailed)	.275	.049	.716		.000	.000
	N	132	132	132	132	132	132
Posts	Pearson Correlation	.110	.145	.148	.393**	1.000	.382**
	Sig. (2-tailed)	.211	.097	.090	.000		.000
	N	132	132	132	132	132	132
Mail	Pearson Correlation	-.219*	-.062	-.173*	.368**	.382**	1.000
	Sig. (2-tailed)	.011	.479	.047	.000	.000	
	N	132	132	132	132	132	132

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

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

Table 13 Correlations among WebCT Hits and 2443 Lecture, Lab, and Total Grades

		Lecture	Lab	Total	Homepage	Organizer	Content	MyGrades	Other
Lecture	Pearson Correlation	1.000	.445**	.875**	-.030	.025	.023	-.091	-.044
	Sig. (2-tailed)		.000	.000	.732	.779	.797	.298	.619
	N	132	132	132	132	132	132	132	132
Lab	Pearson Correlation	.445**	1.000	.823**	-.046	-.003	-.069	.178*	.161
	Sig. (2-tailed)	.000		.000	.598	.970	.432	.041	.065
	N	132	132	132	132	132	132	132	132
Total	Pearson Correlation	.875**	.823**	1.000	-.044	.014	-.023	.039	.059
	Sig. (2-tailed)	.000	.000		.615	.875	.794	.661	.501
	N	132	132	132	132	132	132	132	132
Homepage	Pearson Correlation	-.030	-.046	-.044	1.000	.772**	.653**	.582**	.526**
	Sig. (2-tailed)	.732	.598	.615		.000	.000	.000	.000
	N	132	132	132	132	132	132	132	132
Organizer	Pearson Correlation	.025	-.003	.014	.772**	1.000	.576**	.332**	.443**
	Sig. (2-tailed)	.779	.970	.875	.000		.000	.000	.000
	N	132	132	132	132	132	132	132	132
Content	Pearson Correlation	.023	-.069	-.023	.653**	.576**	1.000	.374**	.409**
	Sig. (2-tailed)	.797	.432	.794	.000	.000		.000	.000
	N	132	132	132	132	132	132	132	132

Table 13 - *Continued*

MyGrades	Pearson Correlation	-.091	.178*	.039	.582**	.332**	.374**	1.000	.455**
	Sig. (2-tailed)	.298	.041	.661	.000	.000	.000		.000
	N	132	132	132	132	132	132	132	132
Other	Pearson Correlation	-.044	.161	.059	.526**	.443**	.409**	.455**	1.000
	Sig. (2-tailed)	.619	.065	.501	.000	.000	.000	.000	
	N	132	132	132	132	132	132	132	132

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

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

Table 14 Standardized Beta Weights for 2444 Communication Factors and WebCT Hits for Total Grades

	Total 2444 Grade		
Variable	Standardized β	t	Sig.
Discussion Posts Read	.188	1.958	.052
Mail Hits	-.100	-1.109	.270
Total Posts	-.021	-.225	.823
Homepage	.299	.939	.350
Organizer	.030	.115	.908
Content	-.318	-2.731	.007
MyGrades	-.076	-.601	.549
Other	.192	2.021	.045

Table 15 Standardized Beta Weights for 2444 Communication Factors and WebCT Hits for Lecture Grades

	Lecture 2444 Grade		
Variable	Standardized β	t	Sig.
Discussion Posts Read	.123	1.280	.203
Mail Hits	-.163	-1.811	.072
Total Posts	.003	.028	.977
Homepage	.345	1.084	.280
Organizer	.020	.076	.939
Content	-.392	-3.369	.001
MyGrades	-.162	-1.290	.200
Other	.140	1.478	.142

Table 16 Standardized Beta Weights for 2444 Communication Factors and WebCT Hits for Lab Grades

	Lab 2444 Grade		
Variable	Standardized β	t	Sig.
Discussion Posts Read	.218	2.284	.024
Mail Hits	-.007	-.078	.938
Total Posts	-.042	-.457	.649
Homepage	.182	.569	.571
Organizer	.035	.132	.895
Content	-.165	-1.413	.160
MyGrades	.037	.296	.768
Other	.207	2.172	.032

Table 17 Correlations among Communication Factors and 2444 Lecture, Lab, and Total Grades

		Lecture	Lab	Total	Read	Posts	Mail
Lecture	Pearson Correlation	1.000	.598**	.905**	.081	.030	-.131
	Sig. (2-tailed)		.000	.000	.354	.734	.135
	N	132	132	132	132	132	132
Lab	Pearson Correlation	.598**	1.000	.881**	.201*	.036	.046
	Sig. (2-tailed)	.000		.000	.021	.683	.603
	N	132	132	132	132	132	132
Total	Pearson Correlation	.905**	.881**	1.000	.154	.037	-.053
	Sig. (2-tailed)	.000	.000		.077	.677	.548
	N	132	132	132	132	132	132
Read	Pearson Correlation	.081	.201*	.154	1.000	.362**	.262**
	Sig. (2-tailed)	.354	.021	.077		.000	.002
	N	132	132	132	132	132	132
Posts	Pearson Correlation	.030	.036	.037	.362**	1.000	.106
	Sig. (2-tailed)	.734	.683	.677	.000		.227
	N	132	132	132	132	132	132
Mail	Pearson Correlation	-.131	.046	-.053	.262**	.106	1.000
	Sig. (2-tailed)	.135	.603	.548	.002	.227	
	N	132	132	132	132	132	132

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

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

Table 18 Correlations among WebCT Hits and 2443 Lecture, Lab, and Total Grades

		Lecture	Lab	Total	Homepage	Organizer	Content	MyGrades	Other
Lecture	Pearson Correlation	1.000	.598**	.905**	.059	.085	-.154	-.026	.101
	Sig. (2-tailed)		.000	.000	.501	.332	.077	.764	.251
	N	132	132	132	132	132	132	132	132
Lab	Pearson Correlation	.598**	1.000	.881**	.215*	.204*	.065	.177*	.250**
	Sig. (2-tailed)	.000		.000	.013	.019	.456	.043	.004
	N	132	132	132	132	132	132	132	132
Total	Pearson Correlation	.905**	.881**	1.000	.148	.158	-.056	.078	.192*
	Sig. (2-tailed)	.000	.000		.089	.070	.521	.375	.028
	N	132	132	132	132	132	132	132	132
Homepage	Pearson Correlation	.059	.215*	.148	1.000	.929**	.668**	.630**	.424**
	Sig. (2-tailed)	.501	.013	.089		.000	.000	.000	.000
	N	132	132	132	132	132	132	132	132
Organizer	Pearson Correlation	.085	.204*	.158	.929**	1.000	.611**	.452**	.410**
	Sig. (2-tailed)	.332	.019	.070	.000		.000	.000	.000
	N	132	132	132	132	132	132	132	132
Content	Pearson Correlation	-.154	.065	-.056	.668**	.611**	1.000	.346**	.362**
	Sig. (2-tailed)	.077	.456	.521	.000	.000		.000	.000
	N	132	132	132	132	132	132	132	132

Table 18 - *Continued*

MyGrades	Pearson Correlation	-.026	.177*	.078	.630**	.452**	.346**	1.000	.321**
	Sig. (2-tailed)	.764	.043	.375	.000	.000	.000		.000
	N	132	132	132	132	132	132	132	132
Other	Pearson Correlation	.101	.250**	.192*	.424**	.410**	.362**	.321**	1.000
	Sig. (2-tailed)	.251	.004	.028	.000	.000	.000	.000	
	N	132	132	132	132	132	132	132	132

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

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

Table 19 Standardized Beta Weights for 2443 Grades and Upper-Level Labs

	Upper-Level Lab Grade		
Variable	Standardized β	t	Sig.
Project 1	.393	2.769	.008
Project 2	.349	1.940	.058
Project 3	.043	.343	.733
Lecture	.118	.890	.378
Lab	-.220	-1.132	.263

Table 20 Correlations among Upper-Level Lab Grades and 2443 Grades

		Upper-Level Lab Grade	Project 1	Project 2	Project 3	Lecture	Lab
Upper-Level Lab Grade	Pearson Correlation	1.000	.235	.107	-.012	.432**	.312*
	Sig. (2-tailed)		.081	.431	.933	.001	.019
	N	56	56	56	56	56	56
Project 1	Pearson Correlation	.235	1.000	.457**	.059	.478**	.653**
	Sig. (2-tailed)	.081		.000	.664	.000	.000
	N	56	56	56	56	56	56
Project 2	Pearson Correlation	.107	.457**	1.000	.388**	.391**	.660**
	Sig. (2-tailed)	.431	.000		.003	.003	.000
	N	56	56	56	56	56	56
Project 3	Pearson Correlation	-.012	.059	.388**	1.000	.064	.298*
	Sig. (2-tailed)	.933	.664	.003		.640	.026
	N	56	56	56	56	56	56
Lecture	Pearson Correlation	.432**	.478**	.391**	.064	1.000	.611**
	Sig. (2-tailed)	.001	.000	.003	.640		.000
	N	56	56	56	56	56	56

Table 20 - *Continued*

Lab	Pearson Correlation	.312*	.653**	.660**	.298*	.611**	1.000
	Sig. (2-tailed)	.019	.000	.000	.026	.000	
	N	56	56	56	56	56	56

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

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

Table 21 Standardized Beta Weights for 2444 Grades and Upper-Level Labs

	Upper-Level Lab Grade		
Variable	Standardized β	t	Sig.
Project 1	.003	.015	.988
Project 2	-.155	-.888	.379
Project 3	-.033	-.233	.816
Lecture	.376	2.322	.024
Lab	.193	.879	.384

Table 22 Correlations among Upper-Level Lab Grades and 2444 Grades

		Upper-Level Lab Grade	Project 1	Project 2	Project 3	Lecture	Lab
Upper-Level Lab Grade	Pearson Correlation	1.000	.452**	.402**	.020	.228	.292*
	Sig. (2-tailed)		.000	.002	.886	.091	.029
	N	56	56	56	56	56	56
Project 1	Pearson Correlation	.452**	1.000	.435**	.050	.176	.524**
	Sig. (2-tailed)	.000		.001	.716	.195	.000
	N	56	56	56	56	56	56
Project 2	Pearson Correlation	.402**	.435**	1.000	-.067	.370**	.721**
	Sig. (2-tailed)	.002	.001		.625	.005	.000
	N	56	56	56	56	56	56
Project 3	Pearson Correlation	.020	.050	-.067	1.000	.064	.122
	Sig. (2-tailed)	.886	.716	.625		.641	.372
	N	56	56	56	56	56	56
Lecture	Pearson Correlation	.228	.176	.370**	.064	1.000	.417**
	Sig. (2-tailed)	.091	.195	.005	.641		.001
	N	56	56	56	56	56	56

Table 22 - *Continued*

Lab	Pearson Correlation	.292*	.524**	.721**	.122	.417**	1.000
	Sig. (2-tailed)	.029	.000	.000	.372	.001	
	N	56	56	56	56	56	56

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

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

Table 23 Pew Research Center Internet User Typologies Means for the Fall 2008/Spring 2009 Research Design and Statistics Cohort and the Results from the National Sample

Typology	Count	Percentage 2443/2444	National Results
Digital Collaborator	18	29%	8%
Ambivalent Networker	19	31%	7%
Media Mover	14	23%	7%
Roving Node	4	6%	9%
Desktop Veteran	1	2%	8%
Drifting Surfer	4	6%	13%
Information Encumbered	2	3%	14%
Mobile Newbie	0	0%	10%
Technology Indifferent	0	0%	10%
Off the Network			14%
Total	**62**		

Table 24 Means and Standard Deviations for the Attitudes Towards Computer Inventory

	M	*SD*
Creativity	5.17	1.33
Helpful	5.54	1.29
Enjoyable to use	5.46	1.38
Intriguing	5.33	0.91
A Sound Investment	6.08	1.03
Easy to Use	5.42	1.25
Non-Threatening	4.92	1.48
Increases Productivity	5.63	1.53
N = 63		

Note. Bolded items were reversed scaled.

Table 25 Means and Standard Deviations for the CyberGuide Goals for 2443/2444 Fall 2008/Spring 2009 Cohort

	M	*SD*
Goal 1	2.52	0.54
Goal 2	2.49	0.65
Goal 3	2.63	0.55
Goal 6	2.61	0.61
Goal 9	2.70	0.53
N = 31		

Table 26 Means and Standard Deviations for Self Reported Learning Styles

for 2443/2444 Fall 2008/Spring 2009 Cohort

Learning Style	Count	Percentage
Aural	4	6%
Kinesthetic	7	11%
Multimodal	16	26%
Read/Write	20	32%
Visual	16	25%
Total	**63**	

APPENDIX H

FIGURES

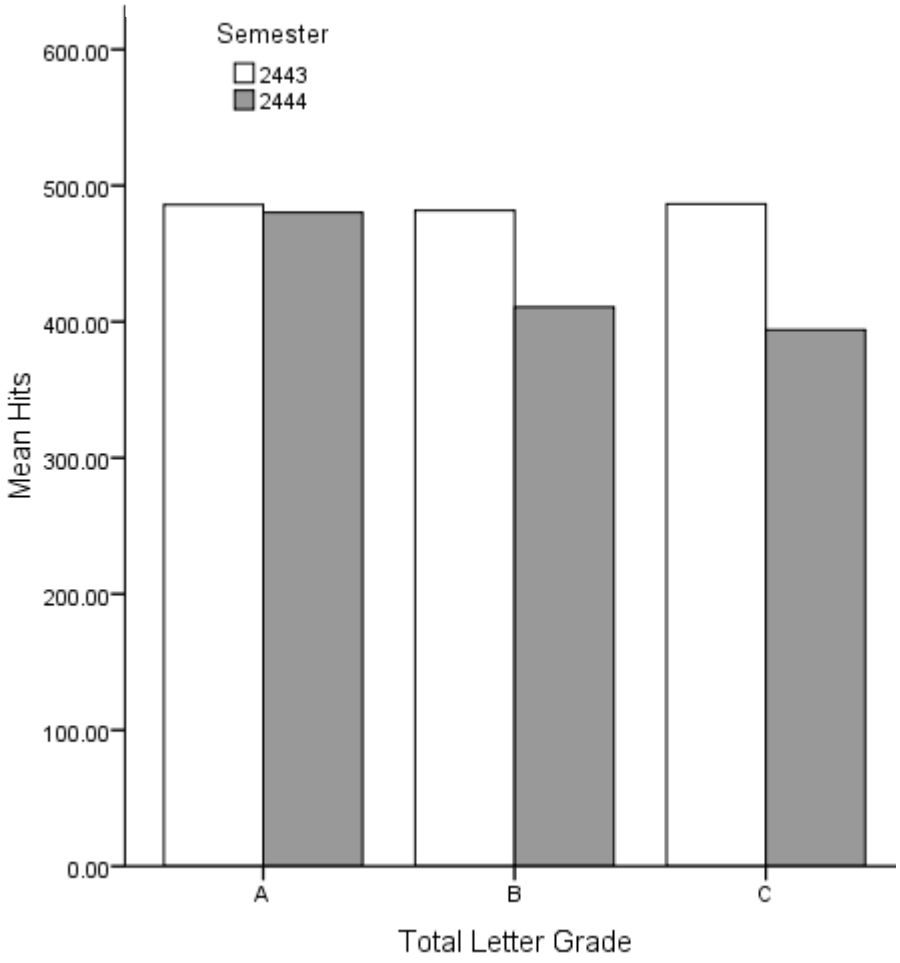

Figure 1 Mean Number of Hits by Semester and Total Letter Grade

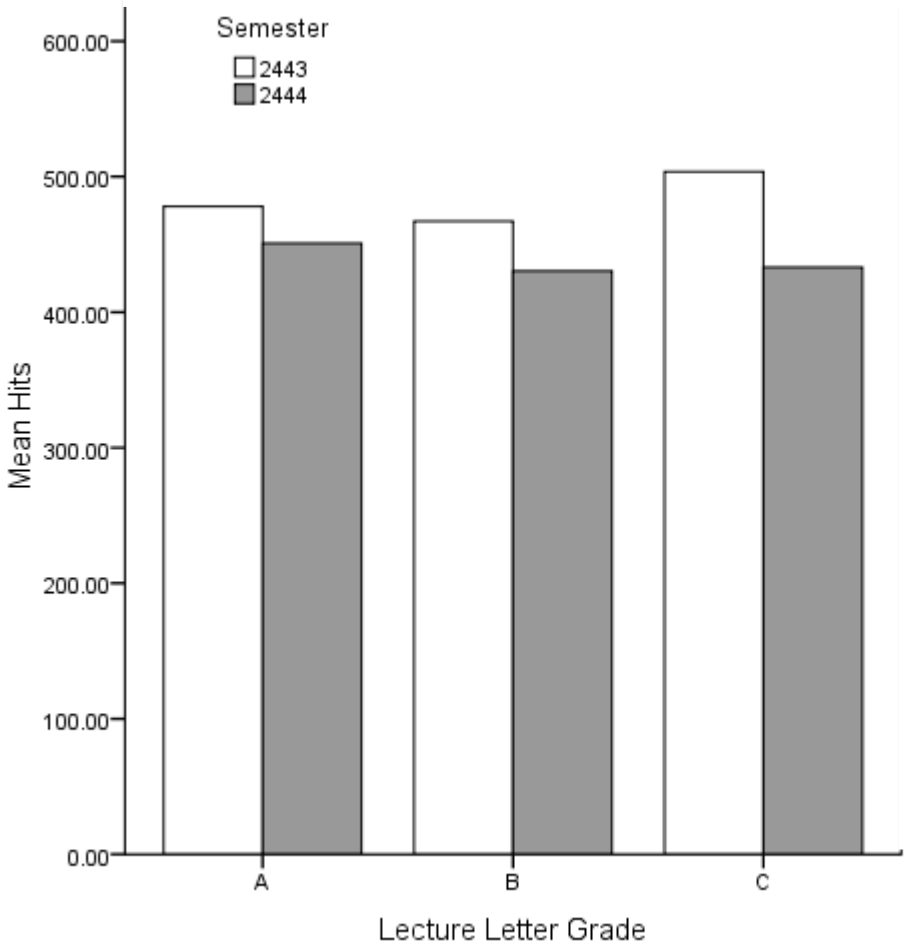

Figure 2 Mean Number of Hits by Semester and Lecture Letter Grade

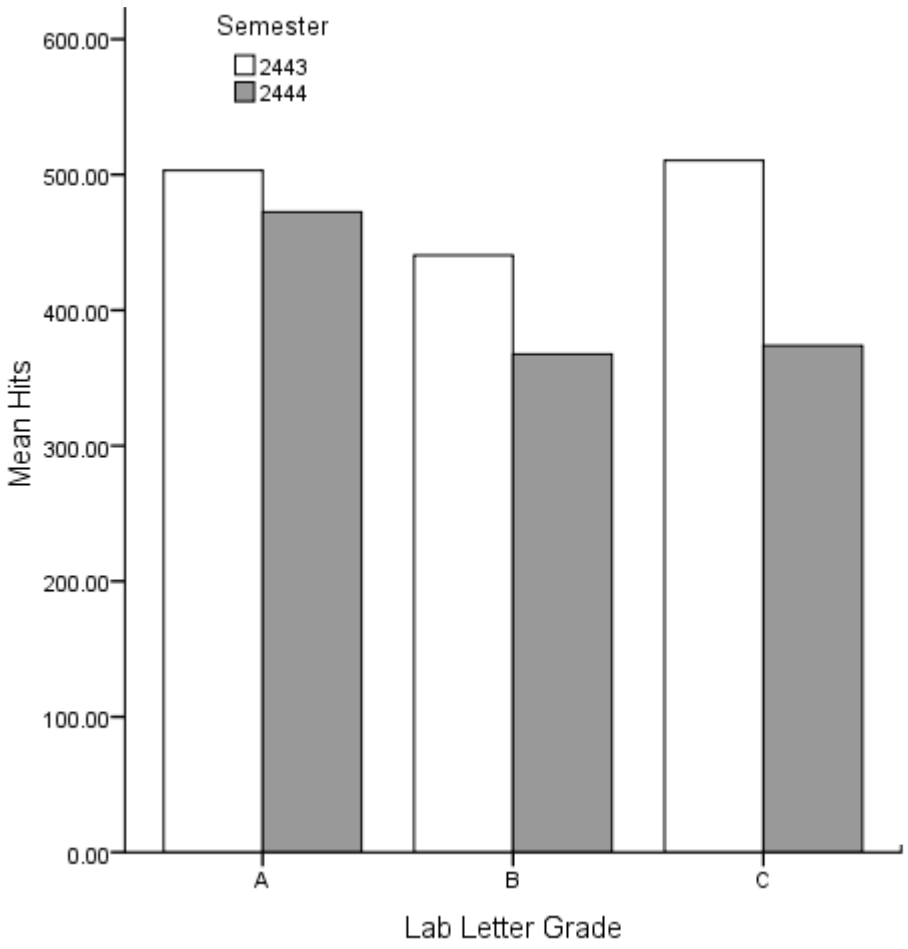

Figure 3 Mean Number of Hits by Semester and Lab Letter Grade

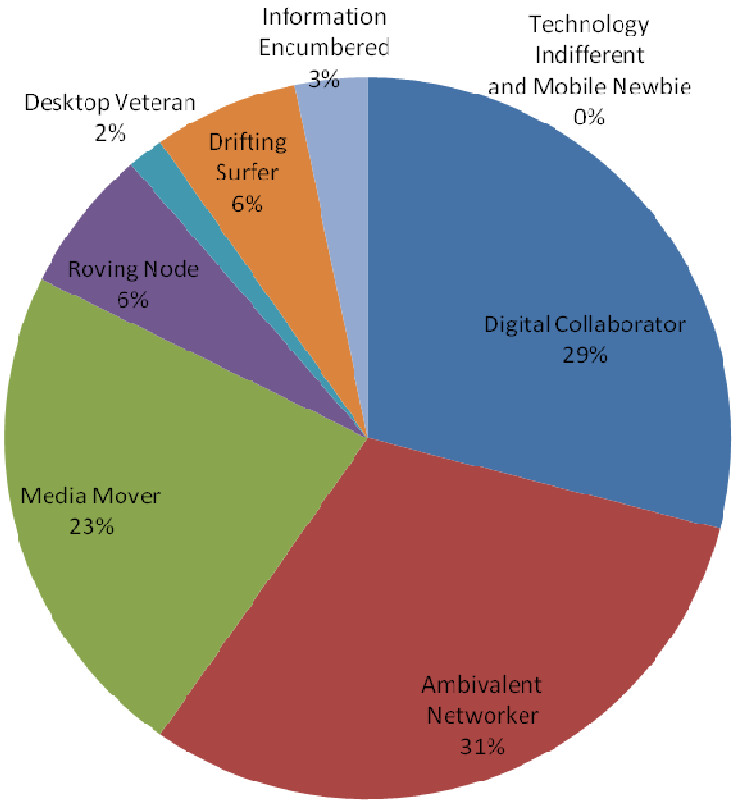

Figure 4 Means for the Fall 2008/Spring 2009 Research Design and Statistics Cohort Pew Research Center Internet User Typologies

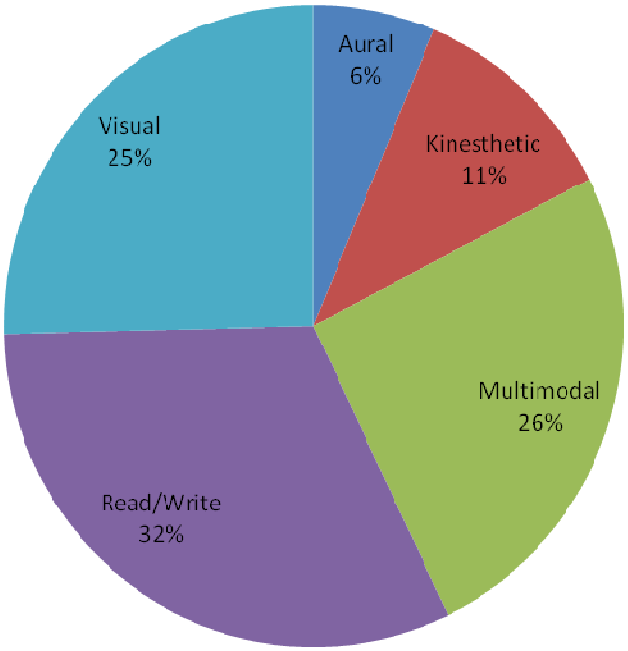

Figure 5 Means for the Self Reports of Learning Styles

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