



**A Quantitative Analysis of the
Performance, Success, and
Demographic Differences between
Internet Students
and Traditional Classroom Students**

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ABSTRACT

Students and faculty have reported satisfaction with course work presented through the Internet. However, little work has been done to determine if the Internet students are learning as well as the students in the traditional classroom. This paper compares the learning of students taught in a community college in Texas that select Internet courses when traditional classes are available taught by the same instructor with similar students choosing the traditional classroom. Student performance is compared using six measures: pretest score, posttest score, gain score, final course grade, grade distribution, and drop rates.

Keywords: internet, community college, traditional classroom

INTRODUCTION

The U.S. military has delivered distance education since the 1940s. They have compared student achievement in distance learning courses with resident courses as early as the 1950s. The military studies include two studies using asynchronous delivery methods. All of the military studies found no significant difference between the achievement of distance learning students and resident students (Barry and Runyan, 1995). Many similarities exist between distance education in 1940 and 2000. It should not be a surprise to the well-read educator that distance education students have been performing as well as their traditional classroom counterparts over the last 50 to 60 years. Delivery of courses through the Internet is the newest form of distance education technology. Now is the time to validate the concept that this new form does not violate the principles previously discovered that students can succeed with this new form of delivery.

Statement of the Problem

The institution of higher education is undergoing a substantial paradigm shift (Dyrud 2000). For hundreds of years teaching has followed the basic Socratic method with one instructor in a common room teaching a group of students. The primary means of teaching was (is) lecture (Leidner 1995). As books became available to the average student, the teacher became, in many cases, an interpreter of the textbook. Professors are experts in their field of study, and most find that a single textbook is less than adequate to their course of study so they supplement the course material with their own notes. As computers and photocopiers easily publish these notes, we find that more and more students have copies of the instructors' notes as well. In an earlier, less technological time, students were responsible for transcribing notes in class, and poor note takers typically did not attain the same level of grades as did the good note takers. Richard C. Ryan (Ryan 2000) states that in his online course, the online students had better notes than the traditional students because the notes were available online to the Internet students but not to the traditional classroom students who were responsible for "taking" notes in class. Today, assuming the instructors use the computer to write their notes,

students can have copies of the notes in a matter of minutes. Accumulating the notes was a major component of a college class that is no longer required as a result of new technology. The college classroom today then is devoted to students listening to instructors and interacting with the instructors and other students. This scenario describes the *traditional classroom* as studied in this paper.

The traditional classroom is now supplemented by the *Internet classroom*, which is defined to be a virtual classroom where the students access the instructor and notes electronically through the Internet. The syllabus, homework assignments, and course outline are provided to the students through the Internet. The students, for the most part, submit their assignments electronically. Instructors' notes can be posted on a web site, and/or PowerPoint® presentations may be deployed so that Internet students can see the same "slide show" as the traditional class. An opportunity for interaction is still available, but it is text-based interaction as opposed to visual and audio interaction.

This study compares the students who select either the Internet or traditional classroom when both are available, taught by the same instructor. Some similar studies have attempted to show that the Internet method of instruction is equivalent to the traditional method. This study attempts to show that there are differences in the levels of learning between Internet students and the traditional classroom students.

Examples of learning through the Internet are available in the popular press (Hartman 2001) as well as academic journals. There should be no question as to whether or not institutions of higher education have embraced the Internet as a method of course delivery. Entire universities can be found online (Brenowitz 2001), and graduate programs are available in such abundance that *U.S. News & World Report* dedicated a section to finding the best one (*U.S. News & World Report* 2001). *U.S. News & World Report* lists 130 different **accredited** graduate programs available as of October 2001. Nicole Rivard (Rivard 2001) tells us that students in the last four years have changed from hesitancy in enrolling for online courses to

filling online sections first. As early as 1998, Gregory Bothun declared that course work could be delivered electronically (Bothun 1998).

Certainly some students can complete college courses that are delivered via the Internet. However, the question of whether or not these students are learning as well as the traditional classroom students has yet to be answered definitively. Additionally, colleges concerned with enrollment and retention need information about retention rates in both traditional and Internet classes. The literature suggests that the Internet retention rate is lower than the traditional classroom but does not suggest relationships that educators or administrators can use to influence the retention rates. Linda Cooper (Cooper 2001) suggests that a minimum GPA of 2.5 as a prerequisite to Internet courses is helpful. However, beginning students have not established a meaningful GPA and community college students do not generally have SAT or ACT scores that can be used in lieu of the GPA. Therefore, this study will include an analysis of the TASP (Texas Academic Skills Program) scores as they may be related to the Internet and traditional students. Paula Dominguez and Dennis Ridley (Dominguez and Ridley 2001) have also suggested that the discipline matters in the effectiveness of online classes so there is a need to examine other disciplines for their online effectiveness. This study includes five different courses, four from the computer area, and one speech class.

Motivation for the Study

"Student learning is arguably the most important facet of the pedagogical process" (Bennett & Green 2001). Weatherford College began using an occasional Internet course in the early 1990s, but it wasn't until 1999 that the college committed the resources to establish regular Internet courses. That was the first year that the college tracked courses by type of delivery. Six Internet courses were offered that fall semester. In the spring of 2002, the college offered fifty online classes and was providing online and other distance education classes to students in twenty-three of the fifty community colleges in the state. In May of 2002, Weatherford College was the number two provider of distance education among community colleges in the state of Texas. In the fall of 2000, the college administration was asked the question: "Are the

Internet students learning as well as the traditional classroom students?" The answer was not available on campus, and a review of the literature was begun in an effort to find the answer in published research. The answer was not found in published research, and this study was initiated to help provide an answer to the college's question as well as to add to the growing body of research on the subject.

Wayne D'Orio (D'Orio 2001) states: "Most colleges and universities are still trying to figure out the basic issues surrounding this phenomenon [online classes]." This study is a first step for a community college trying to figure out the issues.

Researchers continue to propose additional research into this field (Jones 1997), (Cooper 1998), (Schulman 1999), (Maki et al 2000), and (Bennett & Green 2001) for additional examples. "There appears to be a shortage of original research" (Bennett & Green 2001). "Continuous and immediate need for further research into the effectiveness of this type [online] of teaching and learning" (Bennett & Green 2001). The Institute for Higher Education 1999 provides a review of contemporary research and states: "There is a relative paucity of true, original research dedicated to explaining or predicting phenomena related to distance learning." Tarane Sondoozi (Sondoozi 2000) provides a critical review of the growing body of literature surrounding online education. Her first conclusion is that much more research needs to be done before institutions of higher education can determine the efficacy of online instruction versus traditional instruction. Hence, another motivation for this study is to build the research database.

Significance of the Study

This study is significant because it examines a variety of coursework and uses the community college as a research base. Amy Glenn (Glenn 2001) reports a similar study for Texas government classes at a community college, but the remainder of the research base appears to be primarily graduate students with a few studies of undergraduate students that generally include upper level students. This study uses five classes to compare the learning differences

between the Internet students and the traditional classes. Earlier studies have focused on a single instrument to measure the learning differences. This study attempts to expand the measures of learning by using several metrics; pretests, posttests, gain scores, end-of-course numeric grades, grade distributions, success rates and drop rates to measure the levels of learning of the two groups. Additionally, this study examines a new demographic, TASP scores, for the two groups.

Definition of Terms

When researching this topic, authors who use a variety of meanings for education terminology cause some confusion. For example, Bennett and Green (Bennett and Green 2001) use the term "online" as a general term for all distance education. Similarly, Drew Robb and Amy Geffen (Robb and Geffen 2000) equate distance education, asynchronous studies, on-line instruction, and e-learning. Indeed, some confusion has been caused by the changing definitions of the terminology. For purposes of this study, the following definitions are used.

Distance Education – This is an all-encompassing term for all kinds of education that takes place when the teacher and learner are separated by space. The separation requires merely that the two not be in the same room at the same time that the instruction is provided. This definition includes the traditional correspondence course delivered through the post office dating back to the 1800s (Bialac 1995), and the current Internet-based courses delivered through electronic media. The term distance education is used to aggregate all the subordinate methods into this one category. Specific types of distance education will be defined in the following paragraphs.

Synchronous education – This is not necessarily distance education. Synchronous education is education where the teachers and students are engaged in the learning experience simultaneously. This occurs in the traditional classroom and, as noted below, occurs in the two-way video version of distance education. This also represents web-based discussion groups.

Asynchronous education - In this method of education, the student and teacher are separated by time. Students learn at their own pace and submit assignments when completed. The traditional correspondence course fits this definition as well as the open enrollment course, where students start and end a course of instruction at times of their choosing. The reader here should note that the Internet courses discussed in this study are not completely asynchronous. The 16 weeks of the semester are constant for both Internet and traditional classrooms. Assignments are due at the same time for both Internet and traditional students. Proctored exams are administered during the same week for both sections. The Internet students have the ability to e-mail homework at any time before it is due, but the traditional students can also make arrangements to e-mail homework. Indeed, in this study the traditional students were permitted access to the online course so they had full access to all course information where the Internet students lacked access to the classroom. Classroom access was not restricted for the Internet students, but they lacked the capability to attend the class hence one of the reasons they selected the Internet section.

Two-way video (and/or audio) - This form of distance education is identified by the use of television cameras and monitors. A teacher is placed in a room with or without students and teaches a course. The course is televised to other classrooms where students watch the televised instructor and participate in the course. This type of class requires equipment to transmit and receive at the instructor's location and compatible equipment at the students' location. Normally the students and teacher are available at the same time. Students can discuss questions with the instructor in real time. This is a form of synchronous education. If the video portion of the course is not available, then this becomes a two-way audio distance education.

Internet (online) (web-based) (virtual classroom) course - This form of education refers to courses that are delivered through the Internet and use e-mail as the primary interaction between students and teacher. It's important to note that the students don't have to use e-mail to interact with the instructor. Students are free to visit, call, mail, or fax the instructor.

However, the course materials (syllabus, course outline, assignments, and instructor presented material) are all to be found on/through the Internet. This study is dedicated to analyzing the students who elect to complete a course via the Internet even though the equivalent course is offered in a traditional classroom setting. This type of student is referred to as an Internet student.

Computer-Assisted (Aided) Instruction (CAI) - This form of distance education makes a computer available for the students' use. The computer may be simply a method for drill and practice, or it may be that course exams are taken on the computer and perhaps graded by the computer. The computer is an additional instructional device that students will use when the instructor is not present. Hence, the computer lab is a form of computer-assisted instruction. This type of instruction usually includes a lecture component.

Gain score – For this paper the gain score is equal to the posttest score minus the pretest score.

Database

The population of interest in this study is community college students who have a choice between an Internet section of a course and a traditional section of a course taught by the same instructor during the same semester. The instructor provides the same materials to both sections. The homework assignments are the same for both sections and both are held to the same course syllabus and schedule. The Internet students take proctored exams to replicate the proctored exams of the traditional classes. A sample of classes was selected by soliciting volunteers from the faculty. The database for the study consisted of four instructors who represented five different sections. Table 1 presents a summary of the classes used in the experimental group. This experimental group does not include two-way video.

**TABLE 1
EXPERIMENTAL DATABASE**

Course Number	Faculty	Course Description	Course Type	Semester	Enrollment Internet/Traditional
COSC 1300	Instructor 1	Microcomputer Applications	ACGM	Spring 2001	47/19
COSC 1309	Instructor 2	Logic Design	ACGM	Spring 2001	8/15
COSC 1309	Instructor 2	Logic Design	ACGM	Fall 2001	9/13
ITSC 1413	Instructor 3	Internet/Web Page Development	WECM	Spring 2001	9/6
ITSW 2437	Instructor 3	Advanced Database	WECM	Spring 2001	11/3
SPCH 1315	Instructor 4	Public Speaking	ACGM	Spring 2002	21/29
Total	4		4/2	4/1/1	85/104

NOTE - ACGM – Academic Course Guide Manual

WECM – Workforce Education Manual

In addition to the experimental group, a demographic group was created that was composed of all courses taught both Internet and traditional by the same instructor during the same semester. Since the experimental group was not randomly selected, the results would not be statistically generalizable to a larger group unless the experimental group was matched to another population. Key demographics were used in an attempt to generalize the results of the study to the college population.

Summary

Some people believe that the traditional university will evolve into a virtual university (Dunn 2000). The transition has begun. How far the university evolves will have to depend to some degree on how successful the Internet students are in achieving the levels of knowledge previously acquired by traditional students.

Of course, the traditional university is not likely to disappear completely. It's likely that courses will exist that are not well received in a virtual classroom. If not, then someone will surely develop such courses. Additionally, instructors will exist that are not well suited to the Internet classes. These courses and instructors will have to be accessed through the traditional means or their information will be lost. The traditional university brings groups of people together for more reasons than the simple classroom experience.

As researchers and educators, we need to examine both paradigms, traditional and Internet, to determine how each should be used. This paper is an effort to add information to the research base that will help determine the right student for the right classroom. This study does not attempt to establish that Internet classes are better than traditional classes or vice versa. Rather, this study recognizes the fact that there are both Internet and traditional classes and makes an attempt to see if the quality/quantity of learning is essentially the same in those two modes. Additionally, the study begins the process of looking for student attributes that identify Internet students and demographic predictors of success so that students who should not be enrolled in Internet classes can be advised to remain in the traditional classroom.

If web-based instruction is equivalent to classroom instruction, we can state the following hypothesis: students in Internet classes will learn the same as their traditional classroom counterparts. The author believes that web-based instruction in this study is inferior to classroom instruction because the Internet student does not participate in the classroom lecture and discussion. This belief was reinforced by Rome Hartman (Hartman 2001) during his presentation on the television show, *60 Minutes*. All other factors being equal, we should expect then that Internet students would show some signs of learning performance below that of the traditional classroom students. However, it's also possible that the better students take the online classes (Leidner 1995); and therefore, we would expect the Internet students in general to outperform the traditional students.

In order to examine the data to determine if Internet students' learning is equal to traditional students' learning the following measures of learning will be established; pretest score, posttest score, gain score, end-of-course numeric grade, class grade distribution, and class drop rate. Additionally, this study will examine key demographics of gender, age, and TASP scores.

ANALYSIS OF DATA

All analysis was done using a significance level of .05 ($\alpha = .05$). The analysis was begun by calculating descriptive statistics for pretests, posttests and gain scores. The results are summarized in tables 7 and 8.

Pretest and Posttest Data

Table 2 depicts the number of Internet students (n) involved in the descriptive statistics data, the median, the mean, and standard deviation for the pretests and posttests.

TABLE 2
DESCRIPTIVE STATISTICS FOR PRETESTS AND POSTTEST RESULTS

	Pretest				Posttest			
	n	Median	Mean	Std Dev	n	Median	Mean	Std Dev
Internet	75	72.5	65.9	21.0	59	83.3	80.6	13.5
Traditional	76	56.3	56.0	20.1	61	75.0	74.6	13.6

The number of students varies among the pretests, posttests, and gain scores because some students enrolled after the pretest had been given to the class, some were absent the days of the test, and some students dropped the course or were absent for the posttest. For the gain scores depicted in table 3, the number of students varies from the pretest and posttest results because the gain scores were matched by students who completed both the pretests and the posttests.

**TABLE 3
GAIN SCORES**

	Gain Score			
	n	Median	Mean	Std Dev
Internet	51	10.0	14.3	20.2
Traditional	56	16.4	18.4	16.8

From table 2, the reader can see that the mean score on the pretests taken by the Internet students is higher than the mean score for the traditional students. Also noticeable is that the median scores for the Internet students are further from the median scores of the traditional students than are the means. The pretest median difference between Internet and traditional students is 16.2 where the difference in the means is only 9.9. Similarly, the posttest median difference is 8.3, and the posttest mean difference is only 6.0. Both standard deviations appear to be similar.

The pretest scores were examined for equal variances, and the hypothesis of equal variance was rejected. The *t* test for unequal variances was run on the pretest scores, and the pretest scores were found to be significantly higher for the Internet students ($t = 2.979$, critical $t = 1.976$). Next, the posttest scores were subjected to analysis of variance and *t* test. Again, the scores were found to have unequal variance, and the *t* test found the Internet students had significantly higher scores than the traditional students ($t = 2.437$, critical $t = 1.980$). After examining the pretest and posttest scores, a matched *t* test was conducted between the pretests and posttests of each group to determine if there was a significant change in the scores. Both the Internet students and the traditional students showed significant gains from the pretests to the posttests. Table 4 provides a complete summary of the matched pair *t* test.

TABLE 4
PAIRED SAMPLE *t* TEST

	Internet		Traditional	
	Pretest	Posttest	Pretest	Posttest
Mean	66.4	80.7	56.3	74.7
Variance	471.7	172.7	365.2	200.3
Observations	51	51	56	56
Pearson Correlation	0.418		0.523	
Hypothesized Mean Difference	0		0	
Df	50		55	
t Stat	-5.076		-8.199	
P(T<=t) two-tail	5.7E-06		4.1E-11	
t Critical two-tail	2.009		2.004	

The matched pair test indicates that the Internet students gain between the pretests and posttests were less than the traditional students, and a *t* test was conducted on the gain scores to determine the significance. It was determined that the gain scores satisfied the assumption of equal variance; and the *t* test confirmed that the traditional students gained more than the Internet students, but the gain was not statistically significant at the .05 level ($t = -1.148$, critical $t = 1.983$). In addition to the lack of statistical significance to the gain scores, the reader is cautioned that gain scores may not be reliable. Several factors make the interpretation of gain scores difficult. These factors include the ceiling effect and regression toward the mean as described by Walter R. Borg and Meredith D. Gall (Borg & Gall 1989). The correlation between the Internet pretests and posttests was .418, and the correlation between the pretests and posttests for the traditional classes was .523.

Grade Distribution, Drop Rates, and Demographic Data

A grade distribution was tallied for both the experimental and the demographic group. The GPA (grade point average) was calculated using the four point system (A = 4, B = 3, C= 2, D =1, and F =0). Table 5 shows the counts for the experimental group while table 6 shows the data for the demographic group.

**TABLE 5
EXPERIMENTAL GROUP GRADE DISTRIBUTION**

	A	B	C	D	F	W	Total	GPA
Internet	29	23	9	2	8	33	104	2.89
Traditional	26	28	10	1	5	15	85	2.99

**TABLE 6
DEMOGRAPHIC GROUP GRADE DISTRIBUTION**

	A	B	C	D	F	W	Total	GPA
Internet	279	218	60	13	63	193	826	3.01
Traditional	393	449	238	41	74	213	1408	2.88

The reader should note that the GPA is essentially the same numerically for both Internet and traditional students in both groups. However, while the GPA may not be different from a statistical standpoint it is certainly different from an academic standpoint as a 3.01 is grade of B where a 2.88 is a grade of C. The data in tables 5 and 6 were analyzed using the chi-square test for independence. The analysis of the distribution of grades for the demographic group shows that there is a significant difference in the two distributions (chi-squared value 75.56 with a critical value of 11.07). In other words, the grades earned by the Internet students as a group are significantly different from the grades of the traditional classes even though the means of the two groups are similar. For ease of interpretation, the two groups are shown here using percentages in table 7.

**TABLE 7
DEMOGRAPHIC GROUP PERCENT GRADE DISTRIBUTION**

	A	B	C	D	F	W
Internet	33.78	26.39	7.26	1.57	7.63	23.37
Traditional	27.91	31.89	16.90	2.91	5.26	15.13

The table of percentages shows that the Internet students had more A grades, less B, C, and D grades. The Internet students had more F and W grades than the traditional students. A similar analysis of the experimental group did not reveal a significant difference between the Internet and traditional grade distributions possibly because of the smaller size of the experimental

group and the small differences in the distributions. Another method of analyzing grade distribution is to examine the percentages of successful versus unsuccessful students in a course.

In this study students are classified successful if they achieve a grade of A, B, or C. Students receiving any other grade shown are counted as unsuccessful. The data in tables 5 and 6 can then be reduced to the data shown in table 8. This summary allows for a statistical analysis using Fisher's exact test. Fisher's exact test is inconclusive on the experimental group ($p = .0236$) but it produces a significant result on the demographic group ($p < .0001$) indicating that the success rate for Internet students is significantly lower than the success rate for the traditional class students.

**TABLE 8
GROUP SUCCESS**

	Experimental Group		Demographic Group	
	Successful	Unsuccessful	Successful	Unsuccessful
Internet	61 (58.7%)	43 (41.3%)	557 (67.4%)	269 (32.6%)
Traditional	64 (75.3%)	21 (24.7%)	1080 (76.7%)	328 (23.3%)

Again, the smaller size of the experimental group could account for the differences in the analysis. Clearly the experimental group displays a smaller percentage of success than the traditional Internet group (58.7% versus 75.3%), but the difference is not significant at the .05 level.

The next analysis was conducted on drop rates. Drop rate data are summarized in table 9.

**TABLE 9
DROP RATES**

	Internet	Traditional
Experimental Group	31.3% (33/104)	13.4% (15/85)
Demographic group	23.7% (193/845)	16.3% (213/1408)

The drop rate has been widely reported in the literature, but the definition of drop rate is not necessarily standard. For this study, the drop rate is calculated using the number of students dropping a class divided by the total number of students enrolled in the class. Fisher’s exact test was employed on this data and, again, is inconclusive on the experimental group ($p = .0393$); but produces a significant result on the demographic group ($p < .0001$) indicating that the drop rate for Internet students is significantly higher than the drop rate for the traditional class students. The percentages for the demographic group are smaller than the percentages in the experimental group indicating that the sample size for the experimental group is too small to detect the difference conclusively.

Our final analysis is conducted on the demographics of age, gender, and TASP scores. The demographic group is used as a standard to compare with the experimental group. A comparison of the means in table 10 demonstrates that the experimental group and the demographic group are equivalent with respect to age.

**TABLE 10
AGE**

	Experimental Group			Demographic Group		
	n	Mean	Std Dev	n	Mean	Std Dev
Internet	104	27.0	10.52	845	27.0	9.78
Traditional	85	22.9	7.24	1428	23.2	8.42

t tests were conducted to compare the mean of the Internet students with the mean of the traditional students. Both t tests produced significant results. The experimental group t value was 3.09 with a t critical of 1.97. The demographic group produced a t value of 9.47 with a

critical value of 1.96. This indicates that the Internet students are older than their traditional classroom counterparts. The gender of the students is summarized in table 11. Analysis of the distribution of the genders among the groups was conducted using Fisher’s exact test. The experimental Internet group had significantly more females than the traditional group ($p = .0088$), and the demographic Internet group had significantly more females than the traditional group ($p < .0001$). This is an indication that more women are enrolling in Internet classes than men.

**TABLE 11
GENDER**

	Experimental Group		Demographic Group	
	M	F	M	F
Internet	39	65	234	611
Traditional	49	36	587	841

The final demographic to be analyzed was that of the TASP scores. A composite score was calculated by adding the three parts of the TASP test. Only complete sets of scores were used. Student data which contained only one or two parts of the TASP were not included in the calculations. The experimental group produced a t statistic of -0.826 with a critical value of 1.981 while the demographic group produced a t statistic of 1.916 with a critical value of 1.963. A summary of the descriptive statistics for each group is contained in table 12. The Internet experimental group had a lower mean TASP score than the traditional students while the Internet demographic group had a slightly higher mean than the traditional students, but neither difference was statistically significant. These data considered all students who enrolled in the courses and was believed to be skewed based on the number of students withdrawing from the Internet sections, so an additional analysis was conducted on TASP scores for those students who completed their respective courses.

**TABLE 12
TASP SCORES ENROLLEES**

	Experimental Group			Demographic Group		
	n	Mean	Std Dev	n	Mean	Std Dev
Internet	61	704.36	75.09	460	700.26	70.37
Traditional	56	714.79	61.11	928	692.68	67.33

Table 13 depicts the TASP score descriptive statistics for only the students who completed the courses. The *t* statistic analysis for the completers produced results similar to the results for the total enrollment shown in table 12. No significant differences between the Internet students and the traditional students in either group were discovered. Also, no statistically significant differences were noted between the experimental group and the demographic group with respect to TASP scores.

**TABLE 13
TASP SCORES COMPLETERS**

	Experimental Group			Demographic Group		
	n	Mean	Std Dev	n	Mean	Std Dev
Internet	38	706.42	77.87	333	701.69	72.34
Traditional	46	714.44	62.25	764	696.56	66.76

Summary

The previous analysis of data indicates, for this study, that Internet students scored significantly higher on their course pretests and their course posttests. Their test score gain was not significant when compared between groups, but both groups showed significant gains in test scores.

A chi-square analysis of the letter grade distributions indicates that, in a large group, the grade distributions are different between Internet students and traditional students. Specifically, the Internet students appear to receive more A, F, and W grades and fewer B, C, and D grades than the traditional students. A comparison of successful students versus unsuccessful students (successful students receive A, B, or C grades in a course) indicated that the Internet students have a lower rate of success than the traditional students. Additionally, drop rates among Internet students are higher than traditional students. This result parallels the success result, and the dropping students account for the difference in the success rates.

On demographic data, the experimental group was similar to the demographic group in most cases. Specifically, the experimental group did not differ significantly from the demographic group with respect to age, gender, or TASP scores. However, the Internet students differed significantly from the traditional students with respect to age and gender in both the experimental and demographic groups. The Internet students were older and contained a higher percentage of women than the traditional students. The TASP scores did not vary significantly between the Internet and traditional groups.

SUMMARY, FINDINGS, AND RECOMMENDATIONS

This study examined Internet students' learning at a community college and compared that learning with traditional classroom students' learning to determine if the Internet students were learning as well as their traditional classroom counterparts. The study relies on the availability of a course being offered simultaneously on the Internet and in the traditional classroom. This prerequisite is necessary in order to find the students who willingly choose an Internet course, when there is a traditional class available. If a course is only offered through the Internet then the students have no choice. Similarly, students have no choice if the class is only offered in the traditional classroom. The focus of the study was to compare the Internet students with the traditional students to determine differences in their learning. The number of Internet students is increasing rapidly as are the number of degrees being offered and the

number of institutions offering online courses (Hartman 2001). The web-based classroom is also moving into high schools according to Matthew Washenberger (Washenberger 2001) and Ben Wildavsky (Wildavsky 2001), and we should anticipate this trend continuing into the elementary schools as school systems copy and compete. As this new educational mode sweeps the country, the question “are the Internet students learning as well as the traditional students” remains unanswered. This study has added data to the research base that may help answer that question in the future.

Findings

Internet students in this study appear to be learning as well as traditional students as evidenced by pretest scores, posttest scores, and mean final grades. In six of the seven classes examined for this study, the pretest scores were higher for the Internet students than they were for the traditional classroom students. The aggregate pretest score yielded a significantly higher pretest score among the Internet students than the traditional students. These higher scores indicate that the Internet students may be better prepared academically for the course. Since the author of this study believes that the Internet courses are somewhat more difficult than traditional classes, better prepared students would have at least an equal chance of achieving the same level of learning as the lesser prepared students in the “easier” traditional classroom. The posttest scores for the Internet students were also significantly better than the traditional students, which suggests that the Internet students are completing the course at least as well as the traditional students. Internet students begin with better qualifications, follow a more difficult path, and arrive at the same level of learning as the traditional students. Therefore, the null hypotheses are rejected for Hypothesis 1A and Hypothesis 1B. The gain scores for both Internet and traditional students were not significantly different, so the null hypothesis is not rejected for Hypothesis 1C. Based on these three measures of learning, the Internet students appear to be learning as well as the traditional students.

The grade point average confirms an overall measure of equal success, but the average grade does not tell the whole story. The grade distributions for Internet students and traditional

students were not the same. While the mean of the two groups is not significantly different, the Internet classes were found to have a distribution that was more bimodal than the traditional classes. The bimodal effect was noticed by David J. Lilja (Lilja 2001) as well. Therefore null hypothesis for Hypothesis 2 is rejected.

The grade distribution points to another difficulty facing Internet students. Many more Internet students are withdrawing from their classes than are the traditional students. Therefore, the null hypothesis for Hypothesis 3 is rejected. This high drop rate has been reported frequently in the literature. The scope of this study was not sufficient to identify why the withdrawal rate is higher for Internet students than for traditional students, but certainly determining those reasons should have a priority. Perhaps students who are too busy to go to class soon discover that they are also too busy to do the assigned work. Perhaps students enroll in an online class thinking that it will be easier than the traditional class and find that is not the case.

With respect to key demographics, this study found that Internet students were older, on average, than the traditional students. This study also found that women made up a significantly higher percentage of Internet students than traditional students. The TASP scores, however, were not significantly different. The null hypothesis is, therefore, rejected for Hypotheses 4A and 4B, but the null hypothesis is accepted for Hypothesis 4C.

This study found that Internet students have a higher percentage of top grades and a higher percentage of withdrawing students than traditional students. Since the author presumes that the Internet course is more difficult as taught in this study, and we have seen that the students are better prepared as evidenced by the pretest scores, we must propose a conclusion that meets all of that criteria. The conclusion suggested by the author is that the better students in the community college are choosing to attend the Internet courses. However, some other students are attending the Internet courses who are either not well prepared for the coursework or not well prepared for the amount of work; and they are forced to drop.

Limitations

The sample used for this study is limited geographically, and thus the results cannot be statistically transferred to the general population of community colleges. However, no unique traits are established or identified for the college involved in this study, so there is no reason to expect that these results could not be replicated at other schools. Indeed, Amy Glen reports similar results at her school.

The experimental group was not selected randomly so statistical inference is not recommended to the community at large; but the experimental group was aligned with the demographic group on key features of age, gender, and TASP scores so there is an expectation that the experimental group is representative of the demographic group with respect to pretest and posttest results.

Recommendations

Internet classrooms should not replace traditional classrooms. Rather they should supplement the college course offerings. College courses can be delivered via the Internet, and some students will complete these courses with the same degree of competency as students that complete the course in the traditional classroom. That does not imply that the Internet class is better or worse than the traditional classroom. However, it does imply that Internet classes are an acceptable method for some people to complete college courses. Certainly the Internet is a more convenient form of education for some students and studies have indicated that the students are generally satisfied with Internet instruction. Based on the growth in Internet education, there appears to be a large demand not satisfied by traditional classrooms. Other research has suggested that Internet classes are more expensive and require more time from the instructor. Internet delivery of course material is probably not appropriate for every course in a college or university based on today's technology. As an example, consider how students would complete a dissection project in a medical class. Virtual reality and other emerging technologies may allow the completion of such assignments online in the future. For now, though, we need to learn the capabilities and limitations of delivering coursework online. A

need for the online course has been demonstrated by the increasing demand in all educational realms (public, private, profit, and non-profit). In the Dallas/Fort Worth metroplex today, ozone warnings that declare the air to be hazardous to your health are a regular occurrence. Given unhealthy air, students will need to commute and learn online.

Assuming that some are well suited to the Internet environment and some courses are not suited to the Internet environment, more study needs to be done to identify which courses should be offered using which method.

The higher drop rate of Internet classes suggests that fewer people are capable of completing Internet classes than are capable of completing the same coursework in the traditional classroom. These results of this study also suggest that Internet classes are harder to complete than the traditional class.

Future Research

The top priority for future research should be to discover the reasons behind the high drop rates in Internet classes. If a particular type of student is unable to achieve success in the world of Internet education, then those students should be advised to avoid Internet classes.

More data needs to be provided to identify who are the Internet students, and why do they select Internet classes. The Internet students in this study were predominantly composed of students who couldn't (or didn't want to) take the traditional class.

There is also additional room to continue the study of students in other disciplines and other areas to expand the data available in comparing Internet and traditional students.

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