

A Comparison of Online and Traditional Testing Methods in an Undergraduate Business Information Technology Course

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Introduction

With high demands on curriculum coverage within the classroom, teachers are in need of an efficient manner in which to conduct non-teaching activities without lessening their impact or purpose. One such activity includes test administration. With the increase in technology over the past several years the integration of technology into the classroom is now affordable and realistic for most universities. One of the latest technological advances is online testing. The use of online assessment integrates computer and Internet technologies for the purpose of student assessment.

Literature Review

In the 1980's the introduction of the computer caused an excitement in education that has yet to be paralleled (Miller, 2000). Within the realm of education, computers assumed two roles: to enhance both teaching and learning (Gibson, Brewer, Dholakia, Vouk, & Bitzer, 2000; Miller, 2000; Newby & Fisher, 1998). Teachers can now use video clips, sound bites, animated graphics, photographs, tables and graphs, drawings, special effects, and more recently, the Internet (Basics of Computer-Based Testing and Assessment, 2000; Doughty, Magill, & Turner, 1996; Hazari, 1998; Song, 1998).

Using computer technology as tool in assessment is one method to incorporate it within a course. Online testing is typically seen in the form of a database of multiple choice questions posted on the Internet with secured access (Bocij & Greasley, 2000; Bull, 1996; Daly, 2000; Doughty et al., 1996; Hazari, 1998; Greenberg, 1998; Gibson et al., 2000; Kumar, 1996; Treadway, 1997; Treadway, 1998; Zakrzewski & Bull, 1998). Even though multiple choice questions are the typical form of assessment seen on the Internet, many software programs also have the capability of using fill-in-the-blank, matching, and essay questions, and some are even capable of producing tests that use a variety of multimedia tools (Basics of Computer-Based Testing and Assessment, 2000; Chauncey, 1995; Doughty et al., 1996; Hazari, 1998; Judge, 1999; Thomson & Stringer, 1998).

There are two main concerns with online testing. One of the concerns is the lack of resources; more specifically, the limit on hardware, software, and technical expertise that

may be needed (Basics of Computer-Based Testing and Assessment, 2000; Bishop, 2000; Bull, 1996; Newby & Fisher, 1998; Zakrzewski et al., 1998). The other main concern lies in the area of security and reliability of the testing system (Bishop, 2000; Bull, 1996; Zakrzewski et al., 1998). An additional system, or a back-up plan should be in place in the event of a breakdown of the system.

There are also benefits of using online testing. Testing could be scheduled when it is convenient for the student, which also encourages students to increase their time management skills (Basics of Computer-Based Testing and Assessment, 2000; Cochran, 1998; Greenberg, 1998; Judge, 1999; Song, 1998). Since the tests are taken online, they can be scored immediately and can provide students immediate feedback (Basics of Computer-Based Testing and Assessment, 2000; Bishop, 2000; Cochran, 1998; Daly, 2000; Gibson et al, 2000; Gokhale, 1996; Greenberg, 1998; Judge, 1999; Song, 1998; Thomson & Stringer, 1998). After the tests are scored, the data can be easily downloaded into an electronic gradebook system (Cochran, 1998; Greenberg, 1998; Treadway, 1997; Treadway, 1998). Another major benefit of online testing is the amount of time that is saved compared to the traditional paper and pencil test for the students (Bocij et al., 2000; Greenberg, 1998; Newman, 2000; Shermis & Lombard, 1998; Song, 1998). Since the paper tests are no longer needed, schools are able to save money that would have been spent on the paper for the exams, and the time spent to score the exams (Newman, 2000; Song, 1998). Greenberg (1998) state that approximately 10% of high schools, and 30 percent of universities nationwide have established computer labs specifically for online testing.

Purpose

The purpose of this study is to examine if online testing yields significantly different results than the traditional paper and pencil method. Specifically the study sought to:

1. Describe the participants on selected demographic variables.
2. Compare the performance of students who took a test online and in a traditional paper and pencil setting by achievement as measured by test grade.
3. Compare the time it took students in the traditional test setting versus online setting.
4. Examine if there is are relationships between the time it took to complete the test, and the grade received in the traditional and online testing groups.

Methodology

A quasi-experimental design was used to control for as many threats to internal validity as possible. This design was used due to the lack of control to have randomization. A nonequivalent pretest-posttest design was used for this study (Cambell & Stanley, 1966).

To control for the testing effect, the main concern with this design, the pretest instrument only had a random sample of questions from the posttest.

Participants

Two intact classes were selected to participate in this project. The study population consisted of two sections of a university level business information systems course with 79 students. This was a purposeful sample (Borg, Gall, & Borg, 1996).

Research Design

Each class used the same course materials, received the same lecture, and completed the same projects. A written pretest was given to all students to determine the content knowledge achievement for the specific unit. The posttest was administered to one group via traditional paper and pencil method (control group) and the other group took the posttest using an online testing method in a proctored lab (experimental group). The independent variable was the testing method while the dependent variable was the posttest score.

Data Analysis

Descriptive statistics were applied to selected demographic variables, pretest, posttest, and time. To show equivalency of groups, t -tests and chi-square were used. To compare the time and test scores of students in the online testing and traditional testing groups t -tests were used. Correlation coefficients were used to examine the relationships between the time it took to complete the test and grade received in the traditional and online testing groups.

Findings/Conclusions/Recommendations

Table 1 shows that the participants were 20.3 ($SD=1.4$) and had a grade point average of 2.5 ($SD=.6$). The t -test revealed there were no differences between the online and paper and pencil groups in age and grade point average.

Table 1. Age and Grade Point Average of Participants and Comparison of Equality of Groups

Variable	MEAN	SD	ONLINE		TRADITIONAL		df	t	p
			MEAN	SD	MEAN	SD			
Age	20.3	1.4	20.3	1.6	20.3	1.3	76	.06	.95
GPA	2.5	.6	2.5	.6	2.6	.6	70	.81	.32

As seen in Table 2, 43 (54.4 %) were male and the majority 66 (89.2 %) were Caucasian. Table 2 also shows that chi-square did not reveal any differences between gender, ethnicity and educational level of the students in the traditional or online groups.

Table 2. Educational Level, Ethnicity, and Gender of Participants and Comparison of Equality of Groups

Variable	<u>N</u>	%	<u>ONLINE</u>		<u>TRADITIONAL</u>		<u>df</u>	<u>X²</u>	<u>p</u>
			<u>n</u>	%	<u>n</u>	%			
Gender									
Male	43	54.4	21	48.8	15	41.7	1	.41	.52
Female	36	45.6	22	51.2	21	58.3			
Ethnicity ^a									
Caucasian	66	89.2	36	87.8	30	90.9	1	.19	.73
African American	5	6.8	4	9.8	1	3.0			
Hispanic	3	4.1	1	2.4	2	6.1			
Educational Level									
Freshman	24	30.4	12	33.3	12	27.9	3	.41	.52
Sophomore	34	43.0	16	44.4	18	41.9			
Junior	12	15.2	6	16.7	6	14.0			
Senior	9	11.4	2	5.6	7	16.3			

Note. ^a Due to the cell sizes data was collapsed and Chi-Square was calculated for majority and minority.

As seen in Table 3, the pretest scores of the groups were not significantly different. The *t*-test also did not reveal a difference between the assessment scores of the traditional and online testing groups. However, a difference was detected in the time it took the groups to complete the test. The online group took a significantly less amount of time to complete the assessment.

Table 3. Pretest, Posttest, and Time to Complete Test for Participants and Comparison of Groups

Variable	<u>ONLINE</u>		<u>TRADITIONAL</u>		<u>df</u>	<u>t</u>	<u>P</u>
	<u>MEAN</u>	<u>SD</u>	<u>MEAN</u>	<u>SD</u>			
Pretest	4.98	1.75	5.32	1.41	74	.94	.35
Score	22.03	3.03	22.60	2.77	77	.88	.38
Time	12.52	2.94	10.80	3.49	77	2.36	.02

Table 4 examines the relationship between test score and the time it took students to complete the assessment. Using Davis's descriptors, the online group had a moderate correlation (.359) and the traditional group had a negligible correlation (.081).

Table 4. Correlation of Test Score and the Time to Complete Test

Test Score	Time		
	<u>r</u>	Interpretation	<u>p</u>
Online	.359	Moderate	.03
Traditional	.081	Negligible	.61
Both	.281	low	.05

Note. Interpretations according to Davis's (1971) descriptors: .01-.09 (negligible), .10-.29 (low), .30-.49 (moderate), .50-.69 (substantial), .70-.99 (very high), and 1.0 (perfect)

Conclusions

The groups were equivalent on age, gender, grade point average, educational level, and ethnicity. The pretest scores also provide support that both groups had a similar level of knowledge before the experiment was conducted. The test scores between the groups were not significantly different. However, the time it took for the students to complete the test was significantly longer for the traditional group. The correlations also provide evidence that there is more of a relationship between traditional test scores and the time it took to complete the test.

Discussion

This multiple choice online assessment method is one manner to assess student learning. To provide an authentic view of student learning instructors should also incorporate other methods of assessment. Many individuals question the security and reliability of using an online testing method. This study provides evidence that online testing provides results that are equivalent to traditional paper and pencil testing in relationship to student test scores. This study did provide the students the online testing in a proctored computer lab to help insure security.

The students did take less time when conducting the online assessment. This improvement in time did provide a more efficient manner for the instructor to assess students. While taking less time students still received equivalent grades. If teachers are incorporating methods such as online grading this methods also saves the instructor time.

Further Research

Further research is needed to examine other assessment methods in an online mode. Students in other subjects (non-computer related) and other levels (k-graduate) also should be examined. Within online assessment, other areas such as immediate feedback,

convenience, productivity, test anxiety, savings of resources, and performance improvement of instructors need to be examined in experimental settings.

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