Management information systems: using a simulated testing package to assess student performance

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ABSTRACT

This paper describes the results of using a simulated testing package to assess student performance in an advanced computer applications course. A pre-test/post-test format was utilized in assessing whether the level of knowledge and skills attained by students who completed the advanced course increased significantly when compared to the knowledge and skills the students possessed when entering the course. SAM, a student assessment tool that uses a simulated environment for testing, was used to measure each student's level of knowledge and expertise both at the beginning of the course and at the conclusion of the course. The comprehensive final exam used by the Management Information Systems Department for the advanced applications course was used as the post-test. This same exam was given at the beginning of the semester as the pre-test.

When a statistical analysis was performed on the scores, the Department found that the pre-/post-test process was not only useful in providing a measure of the learning that took place, but also in providing evidence that the intended outcomes of the technology component of the business core were achieved. The pre-/post-test process thus serves as an effective assessment tool, which is critical for both HLC (Higher Learning Commission) accreditation and AACSB accreditation.

Keywords: Assessment, Pre/Post-testing, Accreditation, IS Assessment, SAM

INTRODUCTION

According to AACSB, "measures of learning can assure external constituents such as potential students, trustees, public officials, supporters, and accreditors, that the organization meets its goals" (AACSB 2007, p. 60). In recent years, there has been a strong emphasis at the university involved in this study on providing course level assessments for accreditation purposes. Although the AACSB standards focus on program level assessment, the AACSB organization recognizes the need for course-level assessments. According to an interpretation of the AACSB standards, "course-level assessments are each faculty member's responsibility" (AACSB Assurance of Learning, 2007, p. 4).

Schuh noted that the emphasis on technology in schools in recent years has changed from providing students with "access to technology to giving them the skills they need to live, work, and learn in an increasingly digital world" (Schuh, 2004, p. 1). MIS 205, Advanced Computer Applications, is a core course required of all business majors at the university described in this study. The course is designed to provide business students with the skills needed to survive in this increasingly digital world.

A central theme in HLC accreditation is the focus on commitment to student learning and the meaningful use of assessment to confirm and improve student learning (HLC, 2007). Prior to the Spring 2007 semester, a general content multiple choice exam had been used to assess whether learning did in fact take place in the advanced applications course. The MIS Department found that the post-test scores were useful in providing a measure of the level of learning that took place and evidence that the intended outcomes of the technology component of the business core were achieved (Paranto & Neumann, 2006). However, the exam included general computer knowledge that all college graduates should possess rather than content that was specific to this particular class. The multiple choice exam provided statistical data to indicate that students scored significantly higher at the conclusion of the class than they did at the beginning of the course, but the MIS faculty felt it would be advantageous to have an exam that covered the specific topic areas and skills taught in the advanced applications course.

The MIS department started the process by meeting to discuss which skills were of utmost importance for business students, in order to update the final exam such that the key concepts and skills were included in the comprehensive final. Once this determination was made, SAM, a student assessment tool that uses a simulated environment for testing, was used to develop the exam. SAM is a Web-based "Skills Assessment Manager" software application that measures users' proficiency in the Microsoft Office applications suite (Access, Excel, PowerPoint and Word), the Windows operating system, and general Internet skills (SAM, 2008). All faculty in the department had an opportunity to recommend changes to the draft exam that was developed and when the final version was ready to go, the pre/post-test process was revised to utilize the SAM package, beginning in the Spring 2007 semester.

METHODOLOGY

The pool of students used to assess learning in the advanced computer applications course (MIS 205) was taken from the Spring and Fall 2007 semesters. There were three sections of seventy (70) students in the Spring semester, all taught by the same instructor. In the Fall, there were three sections of sixty one (61) students taught by two different instructors.

At the beginning of the semester each student took an in-class pre-test over the specific material to be covered in each section of the course. Subsequently each student took a post-test over the same material. This post-test was the comprehensive final used in the advanced applications course. The pre- and post-tests were identical. A statistical analysis was conducted on the results. Faculty members were especially interested in comparing the statistical difference in the pre- and post-test results. We expected that students would achieve a statistically significant higher score on the post-test relative to the pre-test. An added benefit of the process is that the results provide assessment agencies with evidence of student learning.

STATISTICAL RESULTS

Sample Descriptive Statistics

Tables 1 through 3 report the descriptive statistics for our sample. Tables 1 and 2 present the summary statistics for the spring and fall semesters and Table 3 for the combined spring and fall sample. In the spring semester, the individual pre-test scores ranged from 5% to 55%, whereas the individual post-test scores ranged from 32.5% to 97.5%. In the fall, the individual pre-test scores ranged from 7.5% to 72.5%, whereas the individual post-test scores ranged from 40% to 97.5%. Each table also provides the sample mean, median, mode, and standard deviation for the particular semester. The post-test mean, median, and modes for each semester exceed the pre-test values. The standard deviations tend to be greater in the fall as compared to the spring. Thus the variation of scores appears to be greater in the fall semester.

Figures 1 and 2 consist of box plots for the spring and fall semester of 2007 which provide a unique picture of the data. Figure 3 is the box plot for the spring and fall semesters combined. The box plot clearly shows the post-test results exceed the pre-test scores for each semester and the spring and fall semesters combined.

Table 1
Spring 2007 Pre and Post-Test
Sample Descriptive Statistics

	Pre-Test	Post-Test
Sample size (n)	70	70
Mean	29.714	70.036
standard deviation	9.987	14.126
minimum	5.000	32.500
maximum	55.000	97.500
1st quartile	25.000	62.500
median	30.000	70.000
3rd quartile	35.000	79.375
mode	25.000	62.500

Figure 1
Spring 2007 Pre and Post Test
Box Plots

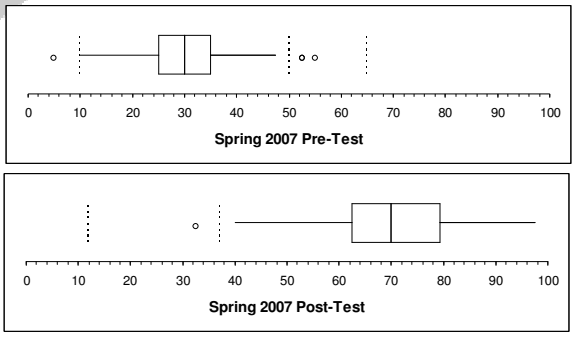


Table 2
Fall 2007 Pre and Post-Test
Sample Descriptive Statistics

	Pre-Test	Post-Test
Sample size (n)	61	61
Mean	30.861	69.713
standard deviation	12.415	14.362
minimum	7.500	40.000
maximum	72.500	97.500
1st quartile	25.000	57.500
median	32.500	67.500
3rd quartile	37.500	80.000
mode	35.000	67.500

Figure 2
Fall 2007 Pre and Post Test
Box Plots

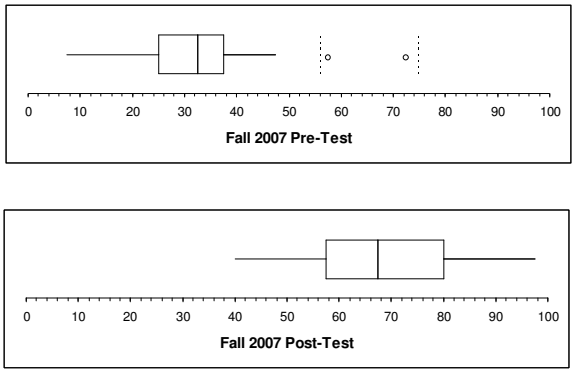
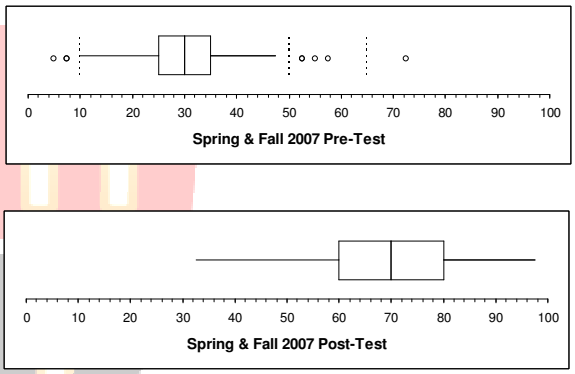


Table 3
Spring & Fall 2007 Pre and Post-Test
Sample Descriptive Statistics

	Pre-Test	Post-Test
Sample size (n)	131	131
Mean	30.248	69.886
standard deviation	11.154	14.182
minimum	5.000	32.5
maximum	72.500	97.500
1st quartile	25.000	60.000
median	30.000	70.000
3rd quartile	35.000	80.000
mode	25.000	67.500

Figure 3
Spring & Fall 2007 Pre and Post Test
Box Plots



Statistical tests of differences in the pre- and post-test means:

Tables 4 and 5 present the statistical results for the tests of differences in means. Table 4 provides the t-statistics for the spring and fall. Table 5 provides the t-test for the combined spring and fall semesters.

Table 4
Tests of Differences between Pre & Post Test Means

	Spring 2007 n = 70 level of significance = .025 or 2.5% critical one-tail: t = +1.9955		**Fall 2007** n = 61 level of significance = .025 or 2.5% critical one-tail: t = +2.0010	
	Pr-test	***Post-test***	***Pre-test***	***Post-test***
Mean	29.714	70.036	30.861	69.713
Standard Deviation	9.987	14.126	12.415	14.362
t Stat	23.17		18.32	
Prob-Value	***1.42E-34***		***1.50E-26***	

Table 5
Tests of Differences between Pre & Post Test Means

	Spring & Fall 2007 n = 131 level of significance = .025 or 2.5% critical one-tail: t = +1.9785	
	Pr-test	***Post-test***
Mean	30.248	69.886
Standard Deviation	11.154	14.182
t Stat	29.30	
Prob-Value	***2.02E-59***	

We arbitrarily set the level of significance at 2.5% (.025). The critical t statistics for the spring semester is t = +1.9955, for the fall is t = 2.0010, and the spring and fall combined is t = 1.9785. In each case the null hypothesis that the pre- and post-test means are equal must be rejected (not accepted). The probability values in each case are extremely small providing further support that the post-test means exceed the pre-test means. The statistical results support the hypothesis that the level of knowledge and skills acquired over each semester by students has increased significantly.

OUTCOMES

According to an Interpretation of AACSB Assurance of Learning Standards, "Regardless of the assessment tool that is selected for each learning goal, an acceptable, internal performance benchmark should be established to determine if student performance is acceptable or not. Such a benchmark could be based on the judgment of faculty or a pre-determined standard could be established." (AACSB Assurance of Learning, 2007, p. 11). Due to the difficulty of the exam and the standard of using 60% as a passing score for the class, the following benchmark was established by the department: at least 75% of the students completing MIS 205 will score at or above 60% on the MIS technology-related post-test.

Table 6
Outcomes Assessment

Score	# Students	Percentage	Cumulative[1]
90-100%	16	12.2 %	12.2 %
80-<90%	19	14.5 %	26.7 %
70-<80%	31	23.7 %	50.4 %
60-<70%	36	27.5 %	77.9 %
<60%	29	22.1 %	100.0 %
Totals	131	100.0%	

[1]The Cumulative column indicates the percentage of students with scores greater than or equal to the Score range indicated.

Table 6 provides a breakdown of the post-test percentage scores for MIS 205. As the data indicate, 77.9% of the students who completed the post-test scored at or above 60% on the exam, which satisfies the criteria established by the department.

Data will continue to be collected and evaluated from semester to semester, to evaluate whether student scores continue to meet the established outcomes. Also, due to the ever-changing nature of technology, the exam will need to be evaluated and revised on an annual basis, as the content of the course continues to evolve to keep pace with technology and the ever-changing needs of the business environment.

SUMMARY

The statistical analysis on the pre- and post-tests for both the spring and fall semesters support the hypothesis that there is a significant difference between the mean of the post-test and the mean of the pre-test. Overall, the summary statistics support the contention that students in the advanced computer applications course did learn a significant portion of the material. However, future assessment analysis is necessary to continue to test learning and to find weaknesses in student performance. Clearly, faculty can acquire necessary knowledge from the assessment data to strengthen their course.

The pre-/post-test process will continue to be used to evaluate the MIS component of the business core curriculum. The results will be incorporated into the annual assessment report and will be utilized in modifying the course content and/or the corresponding pedagogy and/or the test itself. The course is divided into five segments or topic areas: word processing, spreadsheets, database, presentation software, and website development. The next step will be to expand the analysis by comparing pre-/post-test scores by topic area.

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