

Altering Testing and Project Methodologies to Enhance Learning

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ABSTRACT

The primary purpose of administering tests and conducting laboratory projects is twofold: (1) to measure the degree of the students' learning and comprehension, and (2) to enhance learning. Often, the first intended outcome is attained but the second purpose is ignored.

The most prevalent testing procedure is to schedule or announce a test and give the students some idea what material will be included. The students then study the indicated material hoping they will be prepared. Usually, they do not know what type of questions they will encounter so their studying is more generalized than specific, or they may try to memorize everything using their short-term memory ability. Each individual student then completes the written test document. The test is graded by the instructor or assistant, and several days later, the scores are posted using some confidential method. When time is not allocated for students to review the test to learn which specific questions may have been answered wrong, the learning aspect of test administration is defeated.

Often, laboratory and experiential projects are treated similarly. Once they are graded and returned to the students, many days may have passed and the course topic area has changed. Time is not normally allocated for review of the project results.

AN ALTERNATIVE

Four courses in Organizational Leadership and Supervision (OLS) and one Electrical Engineering Technology (EET) course at Purdue University experimented with their test administration, scoring and project procedures. The four OLS courses used fifty item tests which included true-false, multiple-choice, fill-in-the-blank and complete-the-sentence type of questions. During the class session immediately prior to the test, the students were allowed ten minutes to preview the test document. In this way they knew the type of questions which would be asked, as well as the degree and breadth of content to be covered. Each test was closed-book and closed-notes and only covered material introduced since the prior test.

The three EET tests included multiple-choice items, problem calculations and applications. Each test was inclusive of covered material since the beginning of the course; however, use of the textbook and notes was allowed.



The first OLS examination in each of the four courses was administered individually using the normal procedure. The second test was given to randomly paired students who previously were informed that this testing technique would be used. However, the pairing didn't occur until the students arrived for the test. The third test followed the same format as the second test except the examination was administered to three-person teams. The pairs and three-person teams, respectively, were to discuss the questions and answers and when agreement was reached, a single test document was completed. The pair members and team members received the same grade.

In the EET course the first two tests were administered individually following the normal procedure. The students did not preview the test prior to the test date. The final test was given to randomly selected pairs. They were to discuss each question or problem and reach agreement on the answer. A single test was completed for each pair and the members received identical scores.

In both the OLS and EET courses individual projects were completed during the semester until the final project which was performed in randomly selected pairs. The project content included information which had been presented by the instructor up to that point in time.

SCORING

To help enhance the students' learning, a multi-repetition scoring methodology was incorporated for each of the OLS tests. Using red pens, each student, pair, or team member immediately graded their own test using notes and the text. If an answer was wrong, the student was to write in the correct answer. This allowed for a minimum of four repetitions of each question-answer which would enhance learning and retention. First, each student read the question and considered the answer. Second, pair or team members discussed the question and possible answers. The agreed-to answer was indicated or written on the test. Third, during the scoring, each question-answer was reviewed and researched via the text and notes for correctness. Fourth, the correct answer to each question was again discussed and upon agreement, the given answer was either verified or corrected. Following the testing and scoring class session, the instructor verified the grading. If corrections were made, the students again reviewed those items during the next class meeting.

The EET test scoring was exclusively done by the instructor. To enhance student learning, however, time was devoted during the next class session for the students to carefully review their test results. A thorough discussion and explanation was conducted on any item not fully understood by any student. This enhancement for learning and comprehension was critical since these same questions or topics might be included in a later examination.

All of the projects were graded completely by the instructor. These documents were returned to the students at the next class session and were thoroughly reviewed to further assure understanding.

HYPOTHESES AND RESULTS

Based upon results from the initial OLS course, the instructors' hypotheses for this research were

- (1) Pairs would not score significantly better on the tests than individuals.
- (2) Team test scores would not be significantly better than either pairs or individuals.
- (3) Pairs would not be superior to individuals in performing projects.

All three hypotheses proved to be correct. As Table 1 shows, the OLS and EET average test results showed no significant differences between any testing procedure.



	<u>OLS COURSE NUMBER</u>					EET
	1	2	3	4	total	
#of students	6	12	6	6	30	4
AVERAGE TEST SCORES						
test #1						
individuals	43.7	45.6	43.8	47.6	45.3	79.0
test #2						
individuals						80.0
test #2						
pairs	44.3	45.6	44.5	46.6	45.3	85.5
test #3						
teams	45.0	46.4	45.1	47.7	45.8	

Table 1: Average test scores by course and type of test administration

The OLS average pair scores were identical to the average individual scores at 45.3. The average team scores at 45.8 was one-half point better than the average pairs and the average individual scores. There were no significant differences relative to the test administration methodology used. An OLS class of twenty-six students on another Purdue University campus was taking the same course during the Spring 1995 semester. The identical tests were given to these students as a control group. All of the tests were administered individually following the usual procedure. The test averages were essentially identical for this group: test #1 - 41.6, test #2 -41.1 and test #3 -41.4. Although the test averages for the four courses being studied were higher than the averages for the control group, the difference(s) can probably be attributed to factors other than test administration methodology. However, one factor which should be studied further is the effect of allowing the students a short preview period prior to studying for the examinations.

The test results in the EET course did show an improvement between the individual test averages and the average for the pairs. This result can primarily be contributed to the small number of students in the course, four, and in particular, the scores by one student on the individual tests whose average was 63. Table 2 shows the averages for the first and second individual tests were 79 and 80, respectively. The average score for the pairs was 85.5. Because of the small number of students, only a standard T-test could be used to determine significance. The T-test was calculated and found that this improvement was not statistically significant. The small number of students coupled with the wide range of scores highly impacted the results. The hypotheses that test scores for individuals, pairs and teams would be essentially the same proved to be correct.

The OLS application projects and EET laboratory projects results are shown in Table 2. Both the OLS and EET courses had mid-term projects based upon information presented during the first half of the semester. These projects were individually accomplished. The final experiential term project to demonstrate knowledge and understanding of the fill course content was done in pairs. Both OLS projects were valued at 150 points and the EET projects were valued at 100 points. All the projects were scored by the instructor.

	PROJECTS					EET
	OLS COURSES					
	1	2	3	4	t o t a l	
individual	122	133	128	125	128.2	91.5
pairs	127	138	134	129	133.2	96.0

Table 2: Individual and pair project scores

The average difference in the OLS and EET project scores was 5 and 4.5, respectively, between the individual results and the pairs. The numerical differences were measured using the standard T-test and were found not to be significant. But in all the courses, the instructors indicated that project thoroughness, attention to detail, and depth and demonstration of content understanding were superior for the pairs.

CONCLUSIONS

Although no significant average test score differences were found relative to testing methodology, it is believed that superior learning and retention occurred because of the repetitions involved in the testing, scoring and reviewing procedures. Numerous research studies have shown a positive correlation between the number of repetitions and a person's level of retention.^{1,2,3,4} Using the pairs and teams for testing and scoring in the OLS courses, each question and answer was reviewed a minimum of four times. The EET review sessions following each test also allowed for at least two and many times more repetitions of the test content. These multiple repetitions, therefore, would yield improved retention and learning.

It is recommended, therefore, that testing and scoring procedures be Mher investigated in different types of courses with varying class sizes. If results in those courses corroborate these findings, strong consideration should be given to permanently altering test procedures to enhance students' learning. Further, the instructors recommend that OLS applied, experiential projects and EET laboratory projects be performed by student pairs rather than individually. The shared interaction, knowledge and understanding appeared to greatly enhance project documentation and apparent learning even though the numerical scores were not significantly different.

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