Pretests- A Tool for Learning Transportation Engineering

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Abstract

The authors have been continuously fascinated by the role of pretests in improving students' learning. Pretests have been well recognized as a valuable tool for the assessment of educational objectives. In the SP 08 semester, pretests were used as a tool for learning the subject in a transportation engineering course. The students were encouraged to make handwritten notes during the lecture. There were three pretests in the course. The final examination contained conceptual questions, including design on transportation engineering subject. Except the handwritten notes, no other sources including text books, electronic versions, or xerox copies were allowed to the students during these examinations and pretests. In a survey conducted by the authors, students reported that the pretests gave them several chances to study the subject in addition to paying careful attention to the lecture. They indicated that they got the opportunities for learning the subject before the lecture, after the lecture and just before the test.

This method was compared with a control group class. A statistical test was conducted to establish significant improvements. The result of t test confirmed that the pretests are a powerful tool in learning the transportation engineering subject.

Introduction

As the Chinese proverb goes, only if you do will you understand, while seeing only helps to remember. Hearing once is not going to be of much help. This means that listening to a lecture once will not help much. Listening to the lecture coupled with reading the text book will help to remember. In addition to the reading and listening of the lecture, compiling the notes helps the student to understand.

Schools, colleges, and universities are increasingly turning to the assessment of learning outcomes to evaluate the effectiveness of their programs. Pretests have been regarded as an effective tool for the assessment of educational objectives[1-3].

Methodology

In the SP 08 semester, pretests were used as a tool for learning the subject in a transportation engineering course, CE 3211. The students were encouraged to make handwritten notes during the lecture. There were three pretests in the course. The pretests were half hour long sessions. The final examination contained conceptual questions, including design on transportation engineering subject. Except the handwritten notes, no other sources including text books, electronic versions, xerox copies were allowed by the students during these examinations and pretests

In order to evaluate the improvements we need to make sure that we are comparing apples to apples only[4]. This was obtained by replacing thirty percent grade of the examinations in the traditional method with the same amount of grade in the pretest method. Except this, there was no difference between the two methods. This was established by the design of the overall course grading formula shown in Table 1.

The traditional lecture format and the pretest methods have seventy percent of their grade as the same requirements. Both the courses were taught by the same instructor. The level of difficulty for seventy percent of the grade was the same in both courses. In the traditional lecture format, thirty percent of the grade from the mid-term examination was replaced by the pretest method. In the pretest method, three pretests were conducted. Each pretest consisted of 10% of the grade.

Students were asked to rank several activities on a scale of 1to 5, 1 being to disagree strongly and 5 being to agree strongly. The survey consisted of ten activities ranging from students having never taken pretest before to pretest improving the student's grade on the final (Table 2).

Since the t-test is an excellent tool for comparing the means of two groups, this was used to compare the mean of pretest method over the control group[5, 6]. While conducting the statistical analysis, the effect of differential sample sizes and the minimum required number of samples have been taken care of [7, 8]. This method was compared with a control group class in Spring 07. t test was conducted to determine the statistical significance of pretests in improving the grade on the finals.

Results and Discussion

None of the students took pretests in any other courses. This was a novel concept to them. Majority of the students strongly agreed that pretests would improve their final grade, pretests are a time consuming process, they would recommend pretests to other courses, and they took notes during the lecture. Majority of the students strongly disagreed that pretests are useful only in engineering courses, extensive reading of the text was not required because of hand written notes, read the text and prepared notes ahead of lecture, did second round reading after the lecture, and integrated and organized the notes. The results are in agreement with those of Silage[2].

Pretests are time consuming because students had to make hand written notes and prepare more than the traditional method. Pretests can be used in any course as they provide a thorough learning experience for the student. The results of the t test are shown in Table 3. On the finals, the control group had scored 69% on the average, whereas the pretested group scored 76%. The pretested group showed 10.1% improvement over the control group. With a two-tailed P value of 0.0167, both groups are significantly different, statistically**.** The result of t test confirmed that the pretests are a powerful tool in learning the transportation engineering subject.

Conclusion

In the survey conducted by the authors, students reported that the pretests gave them several chances to study the subject in addition to paying careful attention to the lecture. They indicated that they got the opportunities for learning the subject before the lecture, after the lecture and just before the test. The result of t test confirmed that the pretests are a powerful tool in learning the transportation engineering subject.

Table 1. Grading Formulas

	Control group (Percent)	Pretest group (Percent)
1. Assignments	20	20
2. Attendance and class participation	10	10
3. Mid-term examination	30	0
4.Final Examination	40	40
5. 3 Pretests		30
Total	100	100

Table 2. Student Survey on the Activities of the Chapter

Please rank the following activities on a scale of 1(strongly disagree) – 5(strongly agree).

S.No.	Activity	Ranking	Relative Ranking
1	Never took pretests in other courses	5.0	1
2	Read the text and prepared notes ahead of the lecture	2.3	7
3	Took additional notes during the lecture	4.1	6
4	Did the second-round reading after the lecture and integrated and organized the notes	2.2	8
5	My notes helped me score higher on the tests	4.2	4
6	Extensive reading of the text was not required because of hand-written notes	2.1	9
7	This is a time consuming process	4.3	3
8	Pretests will improve my grade on the final	4.5	2
9	Pretests are useful only in engineering courses	1.8	10
10	Will recommend pretests for other courses	4.2	5

Comments:

Table 3. t-test Results for the Effectiveness of Pretests

	Average Grade on the Final	Standard Deviation	Number of Students
Control Group	69%	8.94	15
Pretested Group	76%	7.87	22

$t_{calculated} = 2.51$

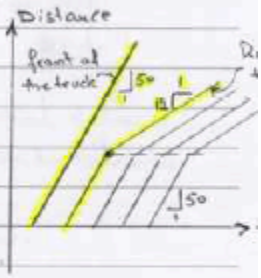
Problem 2

(a) the speed at the front of the platoon: (free condition)

$u = 12$ mph $\quad q_b = 800$ veh/hour

$q = u \cdot k \Rightarrow k_b = \frac{q}{u} = \frac{800}{12} = 66.67$ Veh/mi

$u = \frac{\text{Flow}_f - \text{Flow}_b}{k_f - k_b} = \frac{0 - 800}{0 - 66.67} = 12$ mph



(b) The speed of the shock wave

$u = 12$ mph $\quad q_b = 800$ veh/hour

$K = \frac{q}{u} = \frac{800}{12} = 66.67$ Veh/mile

$u = \frac{0 - 800}{0 - 66.67} = +12$ mph

(c) The speed of the rear of the platoon:

$q_b = 1200$ Veh/hour $\quad K_b = 100$ Veh/mil

$q_a = 800$ Veh/hour $\quad K_a = 16$ Veh/mil

$U = \frac{q_b - q_a}{K_b - K_a} = \frac{1200 - 800}{100 - 16} = 4.76$ mph

(d) The rate of growth of the platoon is = 12 mph - 4.76 mph

rate = 7.24 mph

the platoon grows at this rate as it travels forward

(e) The Density of the shock wave:

FLow = 1200 Veh/h $\quad$ Speed = 7.24 mph

$K = \frac{q}{u} = \frac{1200}{7.24} = 166$ Veh/mil

Fig. 1. Sample Notes made by a Student

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