Performance Assessment of Distance Education Network (DEN) Methods

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Abstract

Increasing globalization of the engineering marketplace has spread to the university education system with the development of distance education systems at many universities within the United States and the world. Within a distance education program (DEN), courses are transmitted from studio classrooms at the home campus via an internet-delivery system. Because DEN students undergo the same academic requirements, curriculum, and must adhere to the same academic standards as on-campus students, their awarded diploma is no different between remote students and on-campus students. This paper evaluates the grade difference between DEN and non-DEN students for one graduate level civil engineering construction management course. The paper conducts a comparison of grades broken down by grade component (i.e. homework, term projects, and examinations), year of the course, and whether the student is a DEN student or an on campus student. Analysis findings indicate that the scoring difference between the two groups is minimal with the exception of the homework score where the DEN students performed worse than the on campus students.

Introduction

This paper evaluates the grade difference between distance education program and on campus students for one graduate level civil engineering construction management course. The subject of this analysis is a graduate level course at a top civil engineering school in the western United States. The course is offered twice a year. The specific student data used in the analyses of this paper are for three sessions offered in Fall 2006, Fall 2007, and Fall 2008. The course is made of international students and domestic students with about two thirds of the students being international students. The course is taught on a semester basis with fifteen sessions and one extra final exam session. The majors of the course students are mainly Masters of Construction Management and Masters of Civil Engineering making up 80% of the students. The remaining 20% of the students come from other engineering degree programs, the business school, the masters of real estate program, and public policy students.

The objective of the course is to provide the student with knowledge of the fundamental principles and practices of cost estimating, budgeting, and cost control of construction projects necessary for success as a manager in the construction/project management industry. The course is centered on a semester long cost estimating and control case study of the life of a building project from initial concept to construction with extensive software exercises based on actual project data. Particular emphasis is on standard construction industry estimating software packages.

The grading for the course is divided into four elements with weighting as follows:

1. Homework 25%
2. Term Project 20%
3. Midterm Exam 25%
4. Final Exam 30%

Typically, six to eight homework assignments are given over the semester. The homework topics are the same as the lecture topics. No outside research is needed to complete the homework; however; attendance of lecture and

reading of the course reference materials and textbook is needed to complete about one half of the assignments. The term project is always to complete a detailed bid estimate for an actual local construction project. Students may work individually or in a group not to exceed three estimators. The project is to all work necessary to construct the work on the supplied sheets. IN addition, students are expected to use WBS codes within their estimate and to produce excel charts summarizing their bid breakdown. The estimates are to include overhead, markups, and profit (i.e. supervision, trailer, taxes, bonds, etc.) needed for the project. The final exam and the midterm exam were short answer or short calculation problems. Exam topics mirror the course lectures, but ability to put information from several lectures is expected on the exams. The exam typically includes 12 to 15 questions with partial credit being given. The final exam is comprehensive of all course lectures.

Within a distance education program (DEN), courses are transmitted from studio classrooms at the home campus via an internet-delivery system. Increases in technology are making these program much more prevalent (Shute 2006). Remote DEN students then view the same lecture as home (on-campus) students. These DEN students can view the courses live or later at their convenience. Lectures are archived for the entire semester and can be downloaded. Professor's in-class notes are digitized and posted so students can print them and watch the lecture. Homework is submitted by email or fax to the host university's DEN headquarters. Exams are proctored at local testing centers for students outside of geographic area of the host university. Because DEN students undergo the same academic requirements, curriculum, and must adhere to the same academic standards as on-campus students, the awarded diploma is no different between remote students and on-campus students.

Analysis

Analysis looks at the performance of the DEN students as compared to the performance of the non-DEN (on campus) students. Analysis will begin by looking at how many students are in each group. Score breakdowns across each of the four course grading elements across year of instruction and across whether student is a DEN student are examined Analysis also will examine total course score and total course grade across year of instruction and whether a student is a DEN student or not. Finally, analysis will examine the difference between high and low scores across year, grading element, total score, grade, and whether or not the student is a DEN student. Work by Houdeshell suggests that the scores will differ (2007).

Analysis of enrollment shows that the class is well attended with the about 35 students attending on campus and four to eight students in DEN. The most recent class had the lowest DEN enrollment of any course as shown in Table 1 below. Analysis of grading elements shows that within all four grading elements students have been doing excellent works. Table 2 shows the average score by class year across each of the elements and across the total score and grade point average (GPA). Within GPA, a letter grade of "A", meaning excellent work, corresponds to a 4.0. A letter grade of "B", meaning very good work, corresponds to a 3.0. A letter grade of "C", meaning average work, corresponds to a 2.0.

Table 1. Class Breakdown by Year and On Campus / DEN

Year	Number of Students		
	On Campus	DEN	Total
2006	36	8	44
2007	38	10	48
2008	34	4	38
Total	108	22	130

Table 2. Score Breakdown by Year

Year	Score Breakdown					
	Homework	Midterm Exam	Term Project	Final Exam	Total Score	GPA
2006	0.97	0.94	0.88	0.9	0.92	3.74
2007	0.93	0.87	0.89	0.86	0.89	3.65
2008	0.93	0.89	0.96	0.84	0.9	3.83
Total	0.94	0.9	0.91	0.88	0.91	3.73

Four figures are used to compare performance of DEN and on campus students across each of the four grading elements, the total score, and the GPA. The figure shows the score on the Y-axis and the course element on the X-axis. The blue lines show the on campus student scores; the red lines show the DEN student scores. Within grading elements, homework is abbreviated as "HW". Midterm exanimation is abbreviated as "MT". Term project is abbreviated as "TP". Final examination is abbreviated as "FIN". The total semester score is "TOTAL". Figure 1 shows the comparison for 2006. Figure 2 shows the comparison for 2007. Figure 3 shows the comparison for 2008. Figure 4 shows the comparison for all years (the entire data set).

Figure 1. Year 2006 Comparison of Score Elements by On Campus / DEN

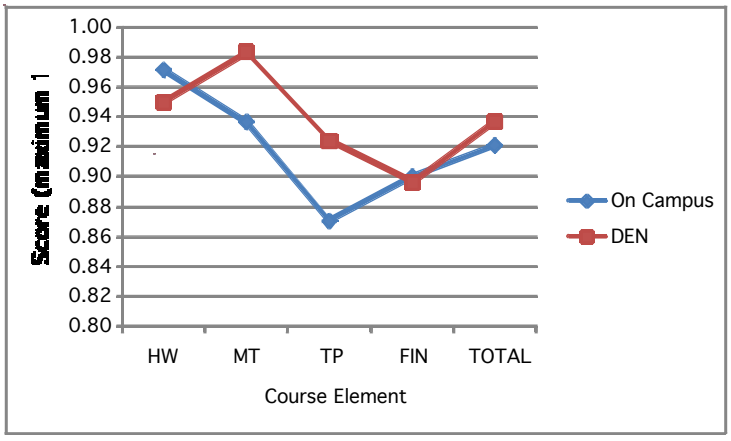


Figure 1 shows that in 2006, DEN students did better than the on campus students in all elements except for home-

work. This is not unexpected since the on campus students have greater access to the course teaching assistant. The DEN student's performance on the midterm and term project offset this lower score from the homework, resulting in a higher overall course grade for the DEN students.

Figure 2. Year 2007 Comparison of Score Elements by On Campus / DEN

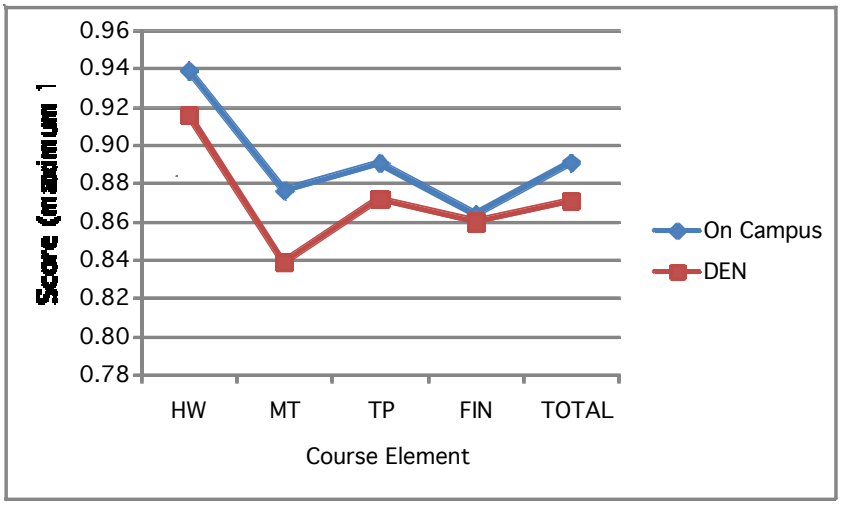
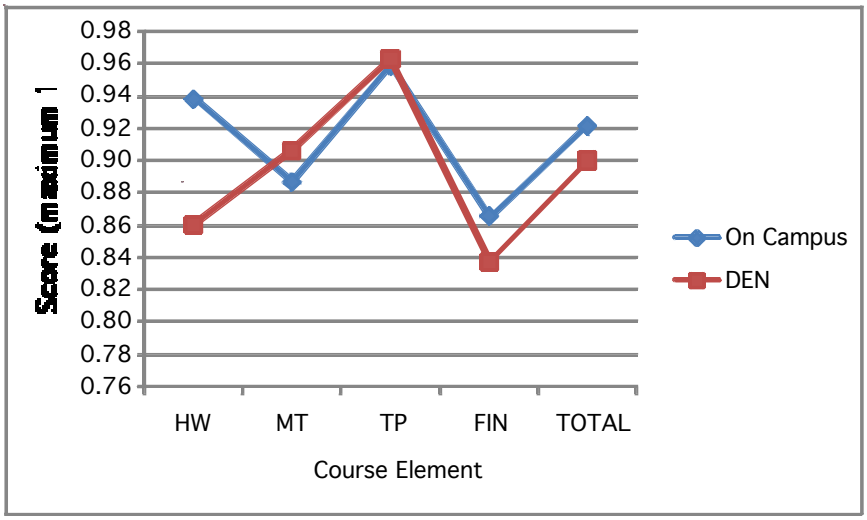


Figure 3. Year 2008 Comparison of Score Elements by On Campus / DEN

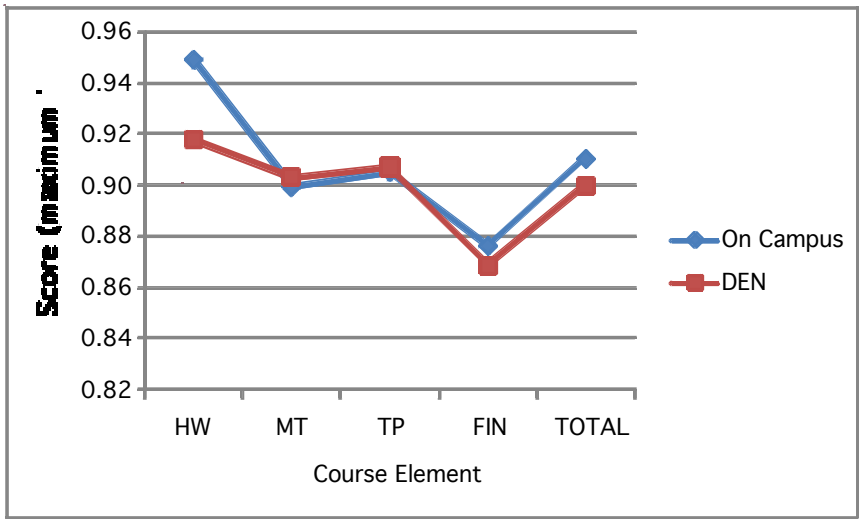
Figure 2 shows a different picture in 2007 as compared to 2006. In 2007 the DEN students did worse than the on campus students in all elements with the final exam scores being close. This is unexpected given the fact that the DEN students did so well in 2006.



Data from 2008 is shown in Figure 3. Similar to Figure 1, the data shows that the DEN students performed worse on the homework assignments. Figure 3 also shows that the DEN students performed better than the on campus students on the midterm, essentially the same on the term project, and slightly worse on the final. Overall, the DEN student's total score was lower than the on campus students in 2008.

Figure 4 shows the data for all three years. As expected, the only substantial difference between the scores was on the homework where the DEN students performed worse than the on campus students. This lower score on one grading element led to a slightly lower total score.

Figure 4. All Years Comparison of Score Elements by On Campus / DEN



The question as to whether the lower scores are created by a single poor performing student as opposed to a larger group is examined in Table 3. Table 3 shows that the maximum, minimum, and delta between the low and high scores (expressed as a percentage of the low score) for each scoring category, for total grade, and for GPA for all years. Table 3 is also highlighted to show the lowest element for each sub group. The table shows that DEN students had the lowest low score in homework in 2 of the three years. The lowest low score of the entire table, however, came from on campus students. This is likely attributable to the fact that the on campus students represent a much larger sample. The high score analysis finds that the highest scores were nearly identical for the DEN and on campus students.

Table 3. Relationship of High Score to Low Score by Course Item, Year, and On Campus / DEN

Year	measure	Score Breakdown					
		Homework	Midterm Exam	Term Project	Final Exam	Total Score	GPA
2006 On Campus	max	1.00	1.04	1.00	1.03	0.99	4.00
	min	0.88	0.65	0.80	0.66	0.82	3.00
	delta	11.7%	37.3%	20.0%	35.9%	18.0%	25.0%
2006 DEN	max	1.00	1.03	0.98	1.00	0.99	4.00
	min	0.75	0.85	0.85	0.75	0.83	3.00
	delta	25.0%	17.1%	13.3%	25.0%	15.9%	25.0%
2007 On Campus	max	0.99	1.02	0.98	1.01	0.99	4.00
	min	0.48	0.64	0.75	0.64	0.74	3.00
	delta	52.1%	37.3%	23.5%	36.6%	25.2%	25.0%
2007 DEN	max	0.99	1.01	0.95	0.99	0.98	4.00
	min	0.65	0.55	0.65	0.46	0.68	2.70
	delta	34.5%	45.5%	31.6%	53.5%	30.5%	32.5%
2008 On Campus	max	1.00	1.04	1.00	1.01	1.00	4.00
	min	0.61	0.59	0.83	0.53	0.77	3.00
	delta	39.2%	43.4%	17.0%	47.9%	23.0%	25.0%
2008 DEN	max	0.97	0.95	0.98	1.00	0.96	4.00
	min	0.58	0.83	0.93	0.65	0.84	3.00
	delta	40.5%	13.2%	5.1%	35.0%	12.5%	25.0%

Conclusions

This paper has compared course results between distance education program (DEN) students and on campus students in a graduate civil engineering course at a western United States university. Score breakdowns across each of four course grading elements (homework, midterm examination, term project, and final examination) across year of instruction and across whether student is a DEN student were examined Analysis also examined the difference between high and low scores across year, grading element, total score, grade, and whether or not the student is a DEN student. The paper found that regardless of whether the student was a DEN or on campus student, the grading was very similar in all categories expect for homework. The DEN students scored lower than the on campus students by 3 percent. This lower homework score also translated into a one percent lower total score for the entire class. Given the minimal difference in score, it seems that the DEN program is working well. Future research should conduct similar studies for larger groups of students across multiple courses. Particular importance in future research should be paid to homework scores. Research could also examine where within each grading element the two groups scored differently.

References

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