Do On-Campus Students Write Better than Their Distance Learning Counterparts in Engineering and Technology Fields?

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Abstract

Over the last several years, distance learning courses have become an important and effective teaching method in many universities in the United States. The performance of distance learning students compared to their on-campus counterparts has been of great interest to many researchers. Writing skills are of particular interest for engineering and technology students since they have such an impact on career success. However, there are no studies that examine measures of quantitative performance in writing skills. This paper contributes to the literature on distance learning performance and compares the writing skills of a sample of distance learning and on-campus students in the Engineering and Engineering Technology Departments at a large urban university. Results of a junior level course and results of an exit-writing exam are used to assess the writing proficiency of both on campus and distance students.

Introduction

Distance education (DE) courses have become an important way of providing college level education to a wider population, particularly those in areas remote to a university or college campus. The method of conducting DE courses is significantly different from on-campus courses. For this and other reasons, monitoring and evaluating such courses are essential in order to assess, modify and improve the overall quality of content delivery and to assure students understand the subjects clearly and achieve learning objectives.

The way of evaluating distance learning differs from one course to another based on the nature of each course. For example literature involving DE course evaluation [1-4] describes a diverse set of approaches including student reports, exams and surveys. As in on campus classes, there can also be a tendency in DE courses towards multiple choice, fill-in the blanks and, true-false tests that eliminate writing in context. An important learning objective in Engineering and Engineering Technology programs is written communication[5]. However, research to examine teaching and learning in distance education has barely kept pace with the growing demand for such courses[6]. Also, there is no study or published research in the literature that evaluates how the writing performance of DE students compare to on campus students in a traditional setting.

The objective of this paper is to begin the study of writing skills of DE students and exploration of research issues related to writing proficiency of DE students in engineering and technology. DE writing proficiency is evaluated based on two sets of data:

i) Results of a university exit-writing exam for undergraduates.
ii) Results of a junior level fluid mechanics laboratory taught as a traditional and as a distance education course.

Exit writing examination overview

The exit writing examination data was gathered at Old Dominion University (ODU), a comprehensive, state – supported institution with over 18,000 students. The university is located in the Tidewater region of eastern Virginia, a metropolitan area with a population of approximately 1.5 million. ODU is among the early pioneers in distance learning through a satellite-based TELETECHNET system and streaming video capability that reaches students at 50 off-site campuses (primarily community colleges in Virginia and other states). The multiple programs offered at ODU draw a wide range of students, including both traditional and non-traditional age students.

As a part of the University's undergraduate writing program, the Exit Examination of Writing Proficiency assesses students' writing competency, and all undergraduates must pass this examination prior to graduation. Students may take the examination once they have attained 58 semester hours of credit, successfully completed the Writing Sample Placement Test, and passed freshman English composition or an equivalent transfer course. The writing test, which is three hours in length, requires students to draft, revise, and edit an essay of 500-600 words in response to a specific prompt provided on the day of the examination. Students register for the examination four weeks prior to the test date and select two broad writing topics from a list comprised of general and college-specific categories. On the test date, students receive an examination packet containing questions/prompts that relate to the topics they selected at registration. Students then choose one of the two questions as the topic for their essay and complete the examination in a hand written format. The registration process allows students to research broad general areas in preparation for the examination, but the lack of a specific question precludes writing an essay in advance of the test. Students are not allowed to bring notes into the testing facility; however, they are allowed to bring a dictionary and/or a thesaurus. Additionally, students falling into the ESL category may bring a dictionary in their native language.

Two faculty members grade each examination, scoring it without any background on the student including the student's name, standing, major, or the other grader's evaluation. Both faculty evaluators must agree on either –"pass" or "repeat" as the assessment outcome. Should the readers disagree, the essay is then sent to a third and final reader. The essay should demonstrate the following:

- A clearly stated objective
- Ability to present supporting evidence
- Clarity in sentence structure and word choice
- Logical consistency
- Reasonable freedom from mechanical errors

Since the initiation of the exam as a university standard, students have been asked a limited number of self-descriptive questions. These responses serve as the basis for segmenting the results and analyzing the research questions discussed below. The data presented in this paper covers test results and related question responses over a five-year period. The pass rate of the exam is used in the evaluation. The pass rate is calculated as the ratio of the number of students who passed the exam to the total number of students who took the exam for each college. Table 1 describes the overall pass rates by engineering and engineering technology disciplines.

	Engineering				**Engineering Technology**		
	Civil	**Computer**	**Electrical**	**Mechanical**	**Civil**	**Electrical**	**Mechanical**
Pass rate	61%	65%	60%	**68%**	66%	**54%**	66%
Test Z score	-0.26	0.91	-0.62	**2.27**	1.24	**-3.19**	1.44

Note 1: E&T overall pass rate = 62%. Bold results are statistically different at a 95% confidence level.

Table 1 Pass Rates of E&T Majors

Performance of DE and non DE students

Since ODU is a large, metropolitan university with a significant military population and a nationally recognized distance learning network, there are a large number of transfer students in the exit writing examination database. This section examines the performance of transfer students compared to those who took their basic composition course at ODU. It begins with a description of the typical transfer student.

Transfer students must have earned a 2.2 cumulative GPA from their previous institution as well as a 2.5 cumulative GPA from their high school of record to qualify for admission. Only courses completed with grades of C or higher may be eligible for transfer credit, and the minimum number of credit hours that must be completed in residence to earn a bachelor's degree is 30. A survey conducted by the university in the fall of 2001 indicated that:

- 75% of the entering transfer students were working for pay, of which 86% were working 20+ hours per week.
- 82% of entering transfer students transferred directly from other institutions with the balance having taken time off from academic study.
- 62% of transferring students did so from community colleges with at least two-thirds of these having earned an associate's degree.
- 9% of the transfer students selected a major within the college of E&T.

The overall pass rate for transfer students was 65% and 58% for non-transfer students. Pass rate results and related test statistics for the E&T majors are summarized in Table 2 using the hypothesis Ho: Pi = P, Ha: Pi ≠ P where Pi is the major pass rate for transfer students (and non-transfer students in the bottom two rows) and P is the overall pass rate. Pass rates that are significantly different at 95% confidence from the overall E&T rate of 62% are highlighted in bold.

- Transfer students had statistically higher pass rates for computer engineering, mechanical engineering, and mechanical engineering technology.

- Electrical engineering technology students had a significantly lower pass rate.
- There were no significant differences in the non-transfer group.

	Engineering				Engineering technology		
	Civil	**Computer**	**Electrical**	**Mechanical**	**Civil**	**Electrical**	**Mechanical**
Transfer pass rate	67%	**74%**	64%	**69%**	68%	**53%**	**72%**
Test Z score	1.09	**2.02**	0.52	**2.01**	1.46	**-2.93**	**2.90**
Non transfer pass rate	54%	60%	55%	67%	60%	55%	55%
Test Z score	-1.49	-0.35	-1.35	1.14	-0.19	-1.29	-1.40

Table 2: Transfer and Non-Transfer Student Pass Rate Summary

Description of the laboratory course

The course is a junior level course offered by the department of Engineering Technology at ODU. The major educational objectives of this course are to have students verify the basic engineering principles of fluid mechanics and understand the practical operation of various fluid devices and measurement of fluid properties.

The course consists of eight experiments performed in the laboratory facility with reports due the week following the laboratory. Students submit eight formal laboratory reports for the eight experiments. All reports have the same format and structure. The handout material for each laboratory experiment includes the purpose or objectives of the experiment, theoretical considerations, a detailed description of the apparatus and the procedure to follow (on campus) or that was followed (video) [7]. Students are required to perform the experiment as a group (on campus) or observe the performance of the experiment (video) and present and discuss results. The presentation of results will generally include tables of recorded and calculated data, sample calculations and computer generated graphs. The discussion will contain the interpretation of the results, usually graphs, and conclusions. The reports are then graded on organization, neatness, accuracy of results, completeness and demonstration of understanding, grammar, and organization of thought in the discussion.

The final exam is a comprehensive closed book exam and is given to the students at the end of the semester. The exam consists of twenty multiple choice questions. Four of these questions concern the mechanics of report writing and data interpretation. The other sixteen questions consist of two questions each about the eight experiments performed. Care is taken to ensure these questions are taken from the lab experiment and are not questions that could readily be answered from knowledge obtained from the pre-or-co-requisite course, Fluid Mechanics. Students need to study and review only the laboratory reports and the given handouts and recall their laboratory experiences to answer this exam completely.

To determine whether on-campus students write better than their DE counterparts, final exam scores for a writing intensive fluid mechanics laboratory course was used. Both on-campus and DE classes were taught by the same instructor, and results are presented for three semesters. In Fig.1, final exam scores are compared for the two groups. It is clear from the figure that none of the on-campus students achieved the maximum score (100) in all three semesters while three DE students were able to achieve the feat. This foreshadowed a general trend that DE students performed better than their on-campus peers in Spring 2001 and Spring 2002. Despite the consistent trend favoring DE students, it should be noted that the performance of DE students was better but not significantly better than the performance of on campus students.

Grades of the laboratory reports for both groups of students, on-campus and distance learning students are used here to show the difference between the two groups.

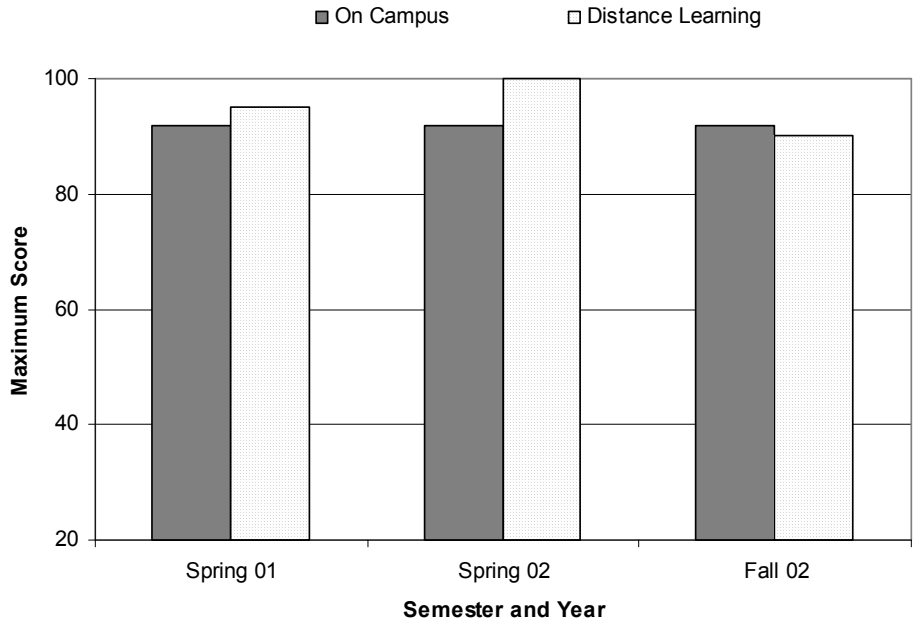

Fig.1 Maximum scores of the final exam

As mentioned previously, a considerable part of the report grade was based on organization, neatness, demonstration of understanding, grammar, and clarity in the discussion section of the report. A correlation between each student's performance on the final exam and their average grade on the laboratory reports is shown in Fig. 2 for Fall 2002. The figure shows final exam scores for both DE and on-campus students starting with the lowest score and ending with the highest. The average laboratory report grade for each student is also plotted in the same order. The range of grades for the final exam for on-campus students ranged from 56 to 96 while grades for DE students ranged from 60 to 96. In general, Fig. 2 shows that the laboratory report grade for both groups follows a similar trend. For example, those students with the lowest final exam score do not always have the lowest average laboratory report grade. Additionally for on-campus

students, the rate of increase from lowest to highest score for laboratory reports was steeper than the rate of increase for final exam grades. Although, laboratory report grades and final exam grades for DE students followed the same trend, the difference in the rate of increase for the two grades was much smaller.

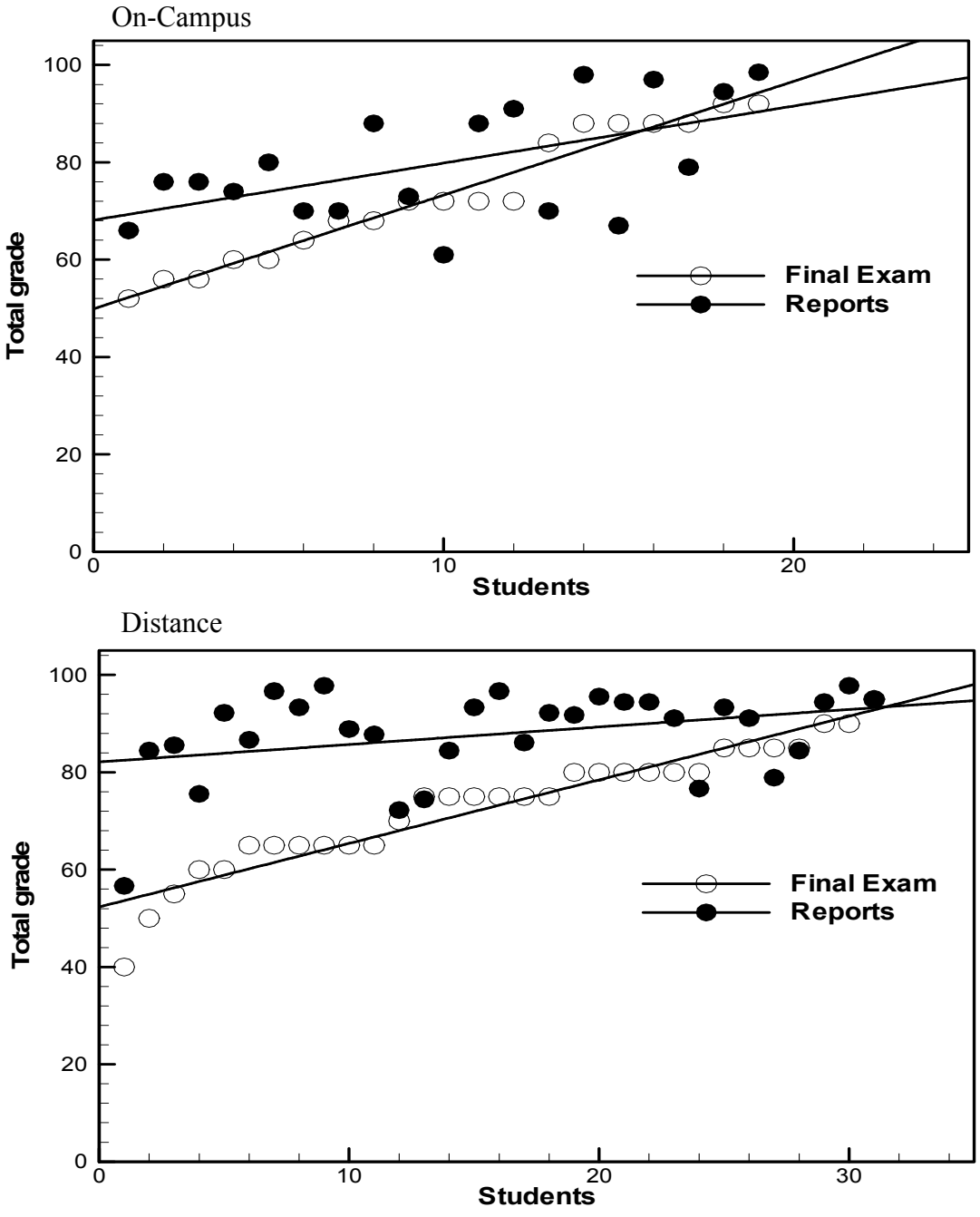

Fig. 2 Reports and final exam grades

To explore these trends further, exit writing data was examined to see if reflected the same trends. Although the exit writing data does not distinguish between DE and non-DE students, data for Engineering Technology students was used as a proxy for DE students since DE students make up nearly 65 percent of the population. In sharp contrast to the previous data, Fig. 3 shows that between 1998 and 2004, on-campus students perform better than proxy DE students on exit-writing exams. Since non-DE students still make up more than one-third of this proxy group, it should be noted that the non-DE students included in the proxy group introduces significant uncertainty in the results. Also, at nearly 65 percent, the low pass rates for Engineering and Engineering Technology students might imply similar writing deficiencies in the two groups of students.

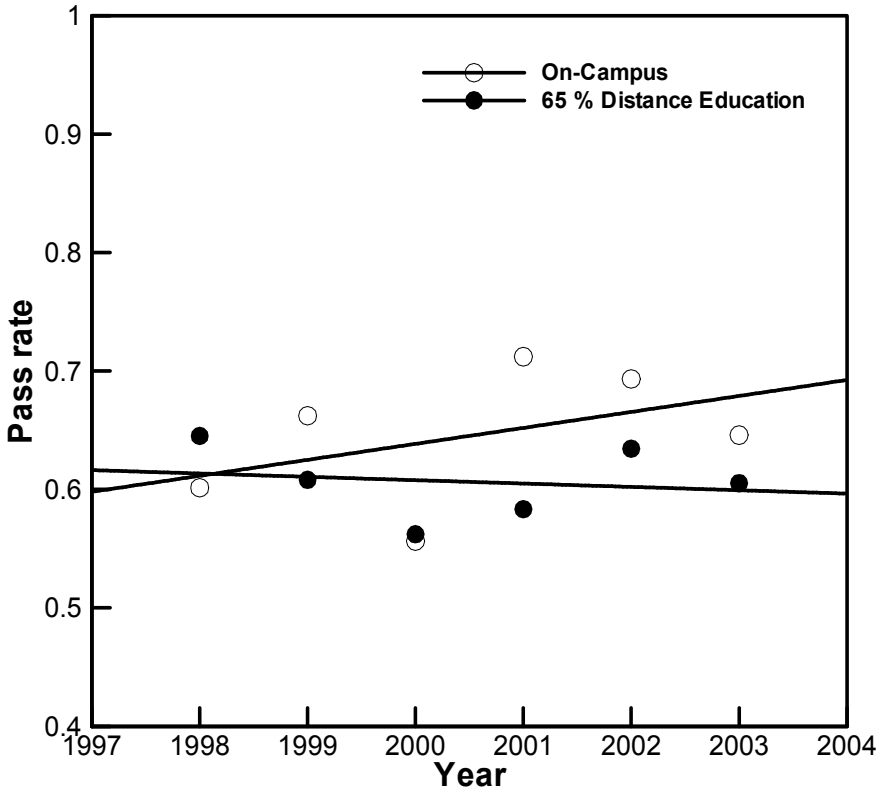

Fig. 3 Exit writing Exam pass rate for on-campus and distance education students.

Conclusion

This study provided mixed results on comparing the writing proficiency of DE and non-DE students. Using the University's exit-writing exam as a criterion, results suggest that on campus students are better writers than their DE peers. These results contradict classroom scores using

final exam and laboratory report grades for a writing intensive Fluids Mechanics Laboratory course. Using this classroom data as a criterion, DE students out performed their on-campus peers. Despite these mixed findings, at nearly 65 percent pass rates for at both Engineering (non-DE) and Engineering Technology (DE majority) students imply a need for more contextual writing in both programs. Based upon this study, several questions deserve future consideration For example, how Engineering and Technology students compare to other students in other colleges. To answers this question, the authors of this paper will solicit participation of other colleges.

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Biographical Information

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