Lecture/Laboratory Instructor Pairings – Does it Make a Difference?

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Abstract

Many colleges and universities do not necessarily make a concerted effort to pair the same lecture instructors with their associated laboratories. This can lead to students being subjected to several classroom scenarios that can have a detrimental effect on learning. Some of these scenarios can include, but are not limited to, lecture and laboratory instructors that utilize different terminology than their counterparts; provide inconsistent emphasis on topics between the lecture and the laboratory sections; and present topics in an order that are not consistent between the lecture and the laboratory sections. The Citadel is no different when it comes to the assignment of its lecture and laboratory instructors, as students will often have a different instructor for each. This paper provides an indirect assessment of instructor/student perceptions as it pertains to the impact of several of the aforementioned classroom scenarios on student learning within associated Mechanics of Materials lecture and laboratory courses. The results show that instructors and students feel that overall learning is increased when a lecture and laboratory is taught by the same instructor which provides consistency in terminology, lecture/laboratory topics, and promotes overall better instructor/student rapport.

Keywords

Instructor Pairing, Laboratory faculty, Lecture faculty, Mechanics of Materials

Literature Review

Courses in a large majority of science and engineering curricula are often complemented by laboratories which provide a learning environment different from a traditional lecture. These laboratories promote student engagement through problem-based learning, resulting in increased student performance, increased student confidence in the subject material[1], and greater enjoyment of the subject material by the students[2]. The lecture courses which these laboratories supplement are often substantially different in size, with one lecture linked to multiple smaller laboratory sections. The connection between these lectures and laboratories has long been observed to play a vital role in the effectiveness of many science and engineering courses[3, 4].

Student performance in the paired lecture and laboratory courses can be affected by several variables. Taking the lecture and laboratory in separate semesters has been shown to negatively affect student performance and retention[5, 6]. The lectures and labs are commonly taught by different instructors, which can cause variations in content integration, topic emphasis, nomenclature, and teaching style. Literature on integrated lecture/laboratory models has noted improvement in student performance in many science and engineering courses ranging from introductory physics and biology to digital signal processing[6-9]. Careful coordination of strategies between lecture and laboratory instructors has been shown to raise student performance as well[10].

Introduction

It is common practice among many colleges and universities in the United States to regularly assign laboratory instructors that are not concurrently teaching the associated lecture course. This can range from graduate students at research-focused institutions to tenure-track faculty at teaching-focused institutions. Regardless of the level of qualification of the laboratory instructors, this disconnect between the lecture and laboratory course instructor can create a host of challenges for student learning. While the argument can be made that students need to be capable of overcoming any differences in terminology, notation, content delivery, as well as in teaching and learning styles. A point can be made that consistency is key to student learning when it comes to foundational engineering courses, such as Mechanics of Materials lecture/laboratory course. In particular, potential challenges due to having different lecture/laboratory instructors arise from:

- Differences in topic emphasis between the lecture and laboratory course;
- Differences in terminology and notation between the lecture and the laboratory instructors;
- Differences in teaching pedagogies or styles that do not appeal to multiple learning styles.

Additionally, potential benefits of having the same lecture/laboratory instructors range from:

- Knowing exactly what topics have been covered between the lecture and the laboratory;
- Adjustment of the pace of the lecture and/or laboratory to suit the material;
- Effective reinforcement of topics from lecture in the subsequent laboratories;
- Consistent use of terminology and notation between the lecture and laboratory course. Imagine initially trying to learn a new language in which the alphabet constantly changed from one class to the next – results would be disastrous except for a select few.

Although unique in its own right, The Citadel is no different than other teaching colleges and universities when it comes to the assignment of lecture and laboratory course instructors. Founded in 1842 in Charleston, SC, The Citadel is a liberal arts college that is one of six senior military institutions in the United States providing a unique military-style education with the purpose of educating principled leaders. The student body consists of approximately 2,300 undergraduate students in 20 majors that are members of the South Carolina Corps of Cadets drawn from approximately 45 states and several countries. Additionally, The Citadel operates robust Evening Undergraduate and Day Veteran Programs that add to the overall uniqueness of the college. However, regardless of the institution, faculty assignment to a paired lecture and laboratory course, especially in lower-level undergraduate courses, is usually dependent upon instructor availability due to upper-level course demands during a semester. Additionally, instructor course load, past performance, and available funds may dictate the use of an adjunct or instructor (non-tenure track) versus tenure-track faculty in a lecture/laboratory course. Therefore, lecture/laboratory instructor pairings are usually low priority because of the aforementioned reasons for course assignment. An indirect assessment was performed that captures student perceptions on the challenges and benefits of lecture and laboratory course instructor pairings.

Mechanics of Materials and the associated laboratory are taken by Civil Engineering juniors in the fall, by Mechanical Engineering sophomores in the spring and by 2+2 transfer evening students in the summer.

Survey of Student Perception of Having Same Instructor for Lecture and Lab

The student perception of having the same instructor for lecture and laboratory was measured by analyzing a '1-5' Likert scale survey ('1' indicating that students strongly disagree with the statement and a '5' indicating that students strongly agree with the statement). The survey of student perception was administered on the first day of the semester. Students were asked to respond to the following statements in the survey:

Q1. Having same instructor for both lecture and lab helps to better connect the theoretical and practical aspects of subject matter.

Q2. Having same instructor for both lecture and lab helps to develop better rapport with the instructor.

Q3. With two different instructors for lecture and lab, I have a chance to develop better rapport with at least one of my instructors.

Q4. Having same instructor for both lecture and lab helps to have a better grasp of the concepts.

Q5. Having same instructor for both lecture and lab helps with reinforcing lecture topics

Q6. Having same instructor for both lecture and lab helps to reduce opportunities for gaps in information or contradictions in explanations about concepts.

Q7. Having same instructor for both lecture and lab helps with a better understanding of what was presented in class.

Q8. Having same instructor for both lecture and lab helps understand the concept better since the same terminologies are used in both lecture and lab.

Q9. Having different instructors for lecture and lab provides an opportunity to have concepts explained from instructors with different teaching styles.

The survey of student perception of having the same instructor for lecture and laboratory was conducted and the mean and the standard deviation for each question is shown in Table 1. The results of the student perception responses were also converted to a percentage scale in the standard way, with a score of '5' being considered equivalent to 100. In this way, an equivalent mean and standard deviation percentage were obtained for the degree of perception Questions 1 through 9. Mean and standard deviation percentage scores for Questions 1-9 are shown in Table 1.

Table 1. Mean and standard deviation of each survey question

Questions	Mean (N =42)	Standard Deviation (N= 42)
Q1	4.10 (82%)	0.82 (16.4%)
Q2	4.30 (86%)	0.80 (13.6%)
Q3	3.15 (63%)	0.90 (18%)
Q4	3.95 (79%)	1.01 (20.2%)
Q5	4.25 (85%)	0.83 (16.6%)
Q6	4.15 (83%)	0.87 (17.4%)
Q7	4.15 (83%)	0.93 (18.6%)
Q 8	4.10 (82%)	0.83 (16.6%)
Q9	3.95(79%)	0.78 (15.6%)

Evaluation of Survey Results

Based on an evaluation of tabulated data, a number of interesting trends and comparisons provide insight into student perceptions of having the same instructor for lecture and laboratory surveyed. As shown in Figure 1, only 33% of students agreed or strongly agreed with the statement that with two different instructors for lecture and laboratory, they have a chance to develop better rapport with at least one of the instructors. On the other hand, 89% of the students perceived having the same instructor for both lecture and laboratory helps to develop better rapport with the instructor.

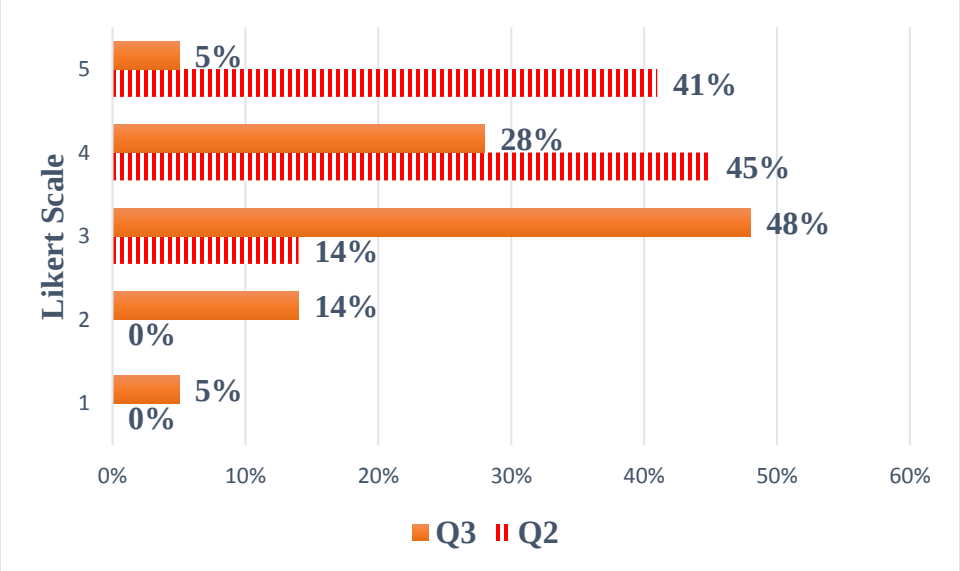

Figure 1. A comparison of survey results for Questions #2 and #3

Figure 2 illustrates that at least eighty percent of the students either strongly agree or agree with the following survey statements: having same instructor for both lecture and lab helps with reinforcement of lecture topics; having same instructor for both lecture and lab helps to reduce opportunities for gaps in information or contradictions in explanations about concepts; having same instructor for both lecture and lab helps with a better understanding of what was presented in class; and having same instructor for both lecture and lab helps understand the concept better since the same terminologies are used in both the lecture and lab.

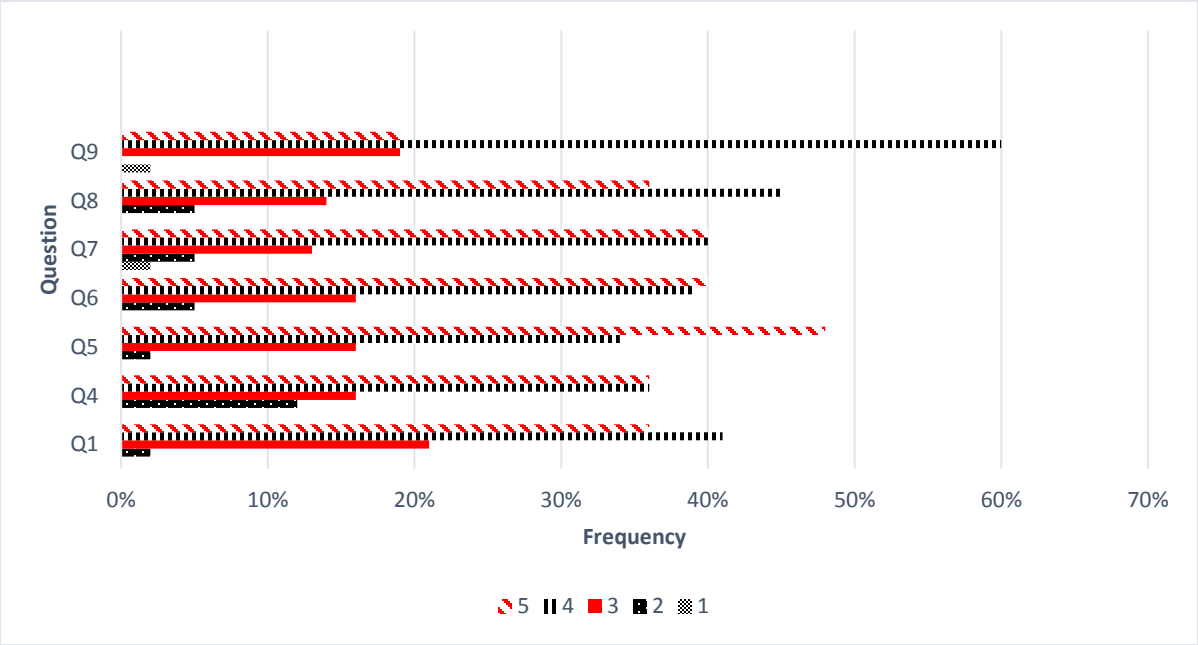

Figure 2. Results of student perception survey

The following is an example of a student comment: "a subtlety in words... Basically, we did not have this professor for lecture. The two professors summarize and use key terms and phrases of the subject matter in very minor but different ways. I'm always torn between figuring for myself and asking a question in the moment of confusion. This moment turns into minutes which exacerbates the problem into missing more material and more confusion with no point to going back for the question." We propose that instructors and students feel that overall learning is increased to a greater degree when the lecture and laboratory are taught by the same instructor.

Conclusions

The authors believe in vast advantages of teaching the lecture and laboratory courses with the same instructor. The Citadel prides itself for small class sizes and student-centered teaching and learning. As with The Citadel's School of Engineering, many sections of the same course exist and there is a need for more than one instructor to teach them all. The authors of this paper are hopeful that the results of this study will be implemented into any future course scheduling. In addition, this may allow for a closer relationship between specific lecture and laboratory sections. The authors also understand that proper pairing of these lecture and laboratory sections may require more involvement of the faculty advisors.

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