The Value of the Involvement of Licensed Surveyors in a Surveying Course

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Abstract

Most often than not, for many college students there is a disconnect between real world engineering practice and classroom learning despite the admirable efforts of professors and instructors to demonstrate the direct importance of applying classroom knowledge in the professional realm. This paper highlights the perception of students on the importance of their interaction with professional surveyors over the course of the semester and how it might have contributed to their overall learning experience. Survey results show that a majority of students perceive their interaction with professional surveyors to be very valuable. Specifically, a mean score of 4.4 on a Likert scale was obtained on responses to questions regarding heightened interest and understanding of students in the surveying discipline after their lectures and field interactions with professional surveyors.

Keywords

Surveying, Student Perception, Licensed Surveyors

Introduction

Most often than not, for many college students there is a disconnect between real world engineering practice and classroom learning despite the admirable efforts of professors and instructors to demonstrate the direct importance of applying classroom knowledge in the professional realm.

The engineering curriculum in most engineering colleges especially those that have received the Accreditation Board for Engineering and Technology (ABET) accreditation require or encourage students to do internships to give them a taste of real world engineering practice. The same can be said of the engineering program at The Citadel. Over the years, the importance of academia-industry collaborations has been stressed in many engineering programs and have led to gains in bridging the gap between the two parties over the past decade[1]. A study by Floyd highlights internships, mentors and guest speakers as three of the five key initiatives, aside establishing an industry advisory board and acquiring modern equipment, for an engineering program that seeks to build a successful academia-industry partnership[2]. Also, the ASCE Body of Knowledge (BOK) encourages students to 'seek relevant work experiences' in the form of summer employment, internships or cooperative education to support classroom learning[3].
One of the ways to create an academia-industry learning environment is with a professor who has had several years of industry experience. Thus, bringing their wealth of knowledge and

expertise from industry and engineering practice into the classroom[4]. Research has shown that students see the value of cooperative experiences and internships[1] and would prefer professors with an industry background[4]. However, not all professors have a rich industry background and would, therefore, have to rely on continued education and research to stay current and relevant in their field of study and the classes they teach. Hence, a strong academia-industry partnership is key to the development of future engineering leaders in our society.

Methods of instruction for a geospatial representation (surveying II) course

Geospatial representation (surveying II) covers a variety of spatial topics for example, topographic mapping, map projections, reference datums, state plane coordinate systems, Global Positioning Systems (GPS), Geographic Information Systems (GIS), and remote sensing. The theoretical and knowledge driven content plus the plethora of new vocabulary and terminology students need to know require a good balance of pedagogical methods to effectively enhance student learning. Therefore, aside direct instruction, active learning techniques such as group work, in-class assignment as well as instant feedback tools such as the 'Plickers[5]' app were employed in class. The instant feedback received from students helped to realign students' understanding of concepts and to correct misconceptions immediately. Also, in addition to regularly scheduled homework assignments, each student was given a topic over the course of the semester to research, write a report on and give a 5-minute presentation of findings. The research presentations gave students the opportunity to be introduced to the processes of doing academic research from the initial searches to the final report. Also, the presentation provides a platform to apply visual presentation tools and improve oral communication skills.

Methods of instruction for a geomatics (surveying II) laboratory

The geomatics (surveying II) labs at The Citadel, over a 2-hour lab period a week, are an invaluable resource for students to bridge the gap between classroom knowledge and practical applications of real world surveying. The geomatics labs are grouped in the following topics: Topographic Surveys; Digital Terrain Modeling (DTM), Global Positioning System (GPS) Surveys and mapping; and Geographic Information System (GIS) mapping and analysis. In the topographic survey labs, students collect point data from different sites on campus using a total station and a data collector to generate location coordinates (Eastings and Northings) as well as elevations for each point using various computational techniques. The data collected in the topographic survey labs are used in the DTM labs to create 3-dimensional surfaces of in Civil 3-D. Also, students are introduced to the concepts of site development and earthwork volume calculations in the DTM labs. In the GPS labs, which is the third grouping of labs, students create a sign inventory of campus. Using a GPS receiver, students log locations and record the conditions of assets such as stop signs, accessible parking signs, fire hydrants, light poles and road name signs. Additionally, the boundaries of assigned groups traverses and the footprint of buildings on campus are surveyed using a GPS receiver. Lastly, the GIS labs engage students through a wide range of vector and raster data analysis such as extraction, map algebra, density analysis, interpolation, surface analysis, geocoding, clipping, buffering, field calculator, spatial joins and map composition. At the end of the semester, student groups are required to create a comprehensive report, including lessons learned, of all labs done during the course of the semester.

Professional Involvement

The Citadel in collaboration with the coastal chapter of the South Carolina Society of Professional Land Surveyors (SCSPLS) is working to educate and equip the next generation of surveyors in the state and beyond. This academia-industry partnership has grown stronger over the past couple of years. The Citadel boasts of a well-rounded surveying curriculum spanning two semesters with two labs. The Citadel is one of the few colleges in the state that offers enough course credits to allow its students to qualify to take the Fundamentals of Surveying exam[6]. The SCSPLS has taken on an active role in student learning to help bridge the gap between students' perception of the importance of class material and its relation to professional engineering practice.

This year professional licensed surveyors from the SCSPLS were invited as guest speakers in two surveying classes. These speakers presented geospatially oriented surveying projects they had worked on while shedding more light on the connection between theoretical knowledge and practical experience to students. Specifically, the speakers highlighted the state of the art of surveying practice in South Carolina through projects such as airport runway surveys, bridge monitoring during running events and beach re-nourishment projects. Additionally, 10 professional surveying crews from the SCSPLS were invited to campus to hold geospatial labs on global positioning systems (GPS) surveys. Three sections of the lab were held to demonstrate using South Carolina's Virtual Reference System (VRS) [which is a Real-Time Network (RTN)] to stake out to a given point location or line from an existing control point. Also, these labs created an atmosphere where professionals could share their experiences with students and students in turn could ask professions questions about the surveying practice in a more informal setting. The involvement and contribution of the coastal chapter of the SCSPLS has been a tremendous source of encouragement for the teaching and learning of surveying at the regional university.

Student Perception Survey

The students' perception survey was administered in the spring semesters of 2018 to 45 undergraduate civil engineering sophomores at the Citadel. The survey instrument, informed consent and survey protocol received approval from the regional universities institutional Review Board (IRB). The focus of the questionnaire was to solicit responses on whether or not the involvement of professionals in class and lab helped to increase students' interest in the surveying. Also, questions on whether students had a better understanding of surveying concepts as a result of the professionals' involvement were asked. Table 1 shows all the questions used in the survey instrument. The 1-5 Likert scale was used as the rating system to scale survey responses. Students had to respond with 5 (strongly agreeing with the statement) and 1 (strongly disagreeing with the statement).

Table 1. Survey Instrument for Student Perception of the Value of Professional Involvement Surveying Course and Lab

		Strongly Disagree 1	**Disagree 2**	**Unsure 3**	**Agree 4**	**Strongly Agree 5**	**Not Applicable**
Q1.	I had surveying experience prior to taking this course	1	2	3	4	5	N/A
Q2.	Having guest professional surveyors in class and lab enhanced my interest in surveying.	1	2	3	4	5	N/A
Q3.	Having guest professional surveyors in class and lab enhanced my understanding of surveying.	1	2	3	4	5	N/A
Q4.	These courses put me in a better position to obtain a surveying internship.	1	2	3	4	5	N/A
Q5.	I would like to have some surveying experience/practice/internship after taking these courses.	1	2	3	4	5	N/A
Q6.	Taking these courses and labs will help me be successful in my internship/practice.	1	2	3	4	5	N/A

Survey Results and Discussion

The student survey responses received were analyzed by question. Table 2 shows summary statistics of student responses included the qualitative average response. Figure 1 shows a graph of the tabulated average Likert scale of the responses.

Table 2: Summary statistics of student responses per question.

	Average	Median	Standard Dev	Average Survey Response
Q1	2.23	2	1.5	Disagree
Q2	4.44	4	0.63	Agree
Q3	4.33	4	0.72	Agree
Q4	4.52	5	0.64	Agree/Strongly Agree
Q5	3.78	4	1.28	Unsure/Agree
Q6	4.38	4	0.67	Agree

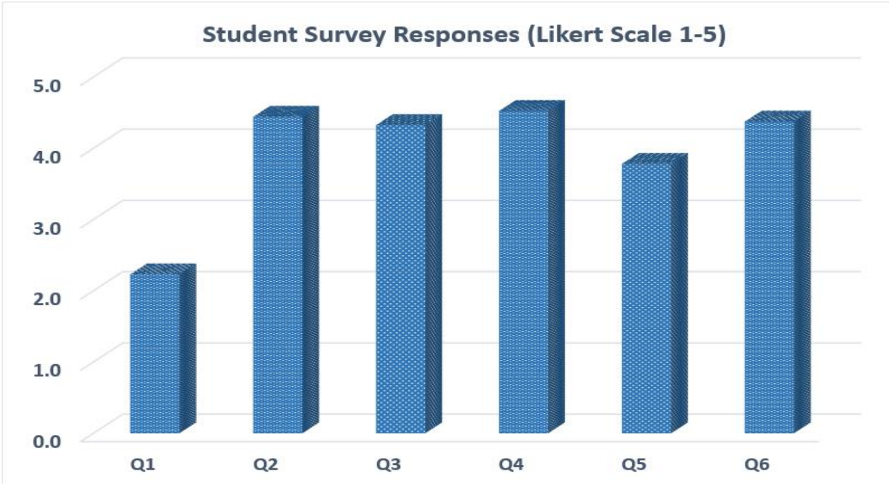

Figure 1: Average (Likert Scale) of student responses per question

The survey results show noticeable positive perceptions on most questions. For Question 2 and Question 3, students mostly agreed (4.44 and 4.33 average scores respectively) that having guest professional surveyors in class and lab enhanced their interest in surveying and understanding of surveying. Also, responses to Question 4 and 6 highlight that students agreed (4.52 and 4.38 average scores respectively) that the surveying courses put them in a better position to obtain a surveying internship and be successful at it. Survey results for Question 5 indicate that students were not too eager to get a surveying internship or job in the near future although most of the responses were agreeable (3.78 average score) to the statement. Results from Question 1 showed that, as expected, a majority of the students in the class did not have prior surveying experience or knowledge. However, 11 out of the 45 students had some prior surveying experience. Hence, an additional analysis was done to compare responses from the 11 students with prior surveying experience with the 34 students that did not have prior experience. Figure 2 shows the graph of comparative survey responses between the two groups of students (prior experience vs no prior experience)

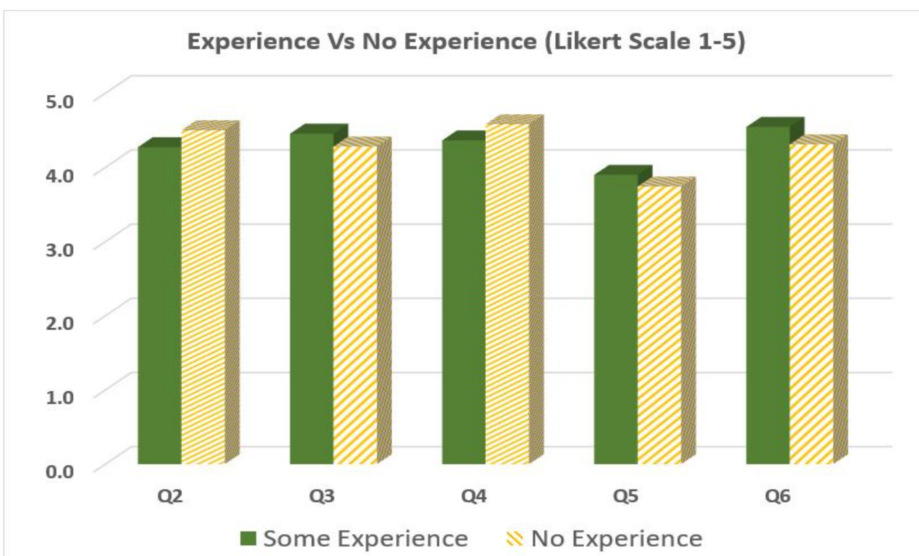

Figure 2: Average (Likert Scale) of student responses per question for Experience Vs No Experience

The results of the comparison between the two groups showed the following. The group with some surveying experience valued the input of the professional surveyors more in helping them understanding surveying concepts and potentially pursue a surveying internship or practice. On the other hand, the group with no surveying experience had a heightened level of interest in the subject and felt that the input of the professional put them in a better position to obtain a surveying internship. Although the results of the comparison between the 'some experience' group and the 'no experience' group showed some differences in opinion, a 2-tailed paired t-test comparing the means of the responses between the two groups resulted in a p-value of 0.9. This suggests that the two sets of means are not significantly different at a 95% confidence level. Overall, students, regardless of their previous experience with surveying, valued the involvement of professionals in the surveying course and geomatics laboratory.

Conclusion

Involving professional licensed surveyors and professional surveying crews in the surveying courses and labs proved to significantly contribute to student learning and interest in surveying. The study results showed that most students, regardless of whether they had previous experience in surveying or not, agreed that having guest professional surveyors in the classroom and being engaged in field interactions with these professionals during labs enhanced their interest in surveying and understanding of surveying. In addition, although students were less likely to pursue a career in surveying or geomatics upon graduation, they felt more prepared in pursuing internships in the field. The results of this study show that most students already have a favorable mindset towards the guidance given in the ASCE Body of Knowledge (BOK) encouraging students to 'seek relevant work experiences' in the form of summer employment, internships or cooperative education to support classroom learning[3]. Overall, the findings from this study agree with findings from previous studies and general professional opinions on the value and importance of academia-industry collaborations in advancing student learning and grooming the next generation of engineers.

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