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Relation between Out-of-Classroom Engagement Activities and Student Performance

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Abstract

In this study, the relation between out of classroom engagement activities and student performances, measured through GPAs, for engineering undergraduate students in civil, environmental and naval engineering majors is assessed. Five different categories of events were identified– career development, community building, physical activity, academic support, and field trips. Attendance at each event was tracked and academic performance after the semester with activities was analyzed. In AY 2023–2024, the department hosted twenty-one undergraduate out-of-classroom activities. Among these, eleven were classified as career-related, three as department community development, one as physical activity, four as academic support events, and two as field trips. Out of the 249 students in the department, 199 attended at least one event. T-tests were used to identify statistically significant differences between attendance rates and performances among different cohorts of students. Correlation coefficients, simple linear regression, and graphical analyses were used to identify the association between student performances and attendance at events. Senior students were more likely to attend events compared to juniors, sophomores, and first year students. There were no statistically significant differences between attendance rates of juniors, sophomores, and first year students. At the end of the Spring 2024 semester, students who attended at least one event had an average GPA that was significantly higher than those who did not attend any event. Furthermore, the average GPAs had a strong positive association with the number of events attended. These trends also held consistent when students were grouped as seniors, juniors, sophomores, and first year. Trends among groups such as participants in the co-op program, international students and student athletes were also studied. Co-op and international students who attended at least one event appeared to have a higher GPA than those who did not attend any. However, these differences were not statistically significant, possibly due to small sample sizes. Student athletes, on the other hand, had almost the same average GPAs among those who attended events and those who did not. The data indicates participation in out of classroom engagement activities and student academic performances have a strong association. Tracking temporal trends over multiple years may provide valuable information that could aid in supporting increased student success.

Introduction

Engagement is defined as a measure of students' involvement, connection, and commitment to academic and social activities in school [11]. Research proposes a correlation between student engagement and retention [1]. Simmons et al. [2] suggested that out-of-class engagement has an impact on students' development, which can sometimes be overlooked by faculty and administrators.

Furthermore, students' engagement in out-of-class activities has been connected with other positive outcomes, including improved analytical, group, and leadership skills [5], increased student-faculty interaction [6], ethical development [7], and greater interest in pursuing and remaining in engineering careers [8] [9] [10]. Despite these positive outcomes, it can sometimes be challenging to engage students outside of the classroom. Major et al [3] identified scheduling issues as a major factor deterring student involvement. Additional research has indicated that

engineering students devote more time preparing for class than students in other disciplines and, therefore, may be less likely to participate in out-of-class engagement activities [4].

The National Academy of Engineering identified in 2001-02 that the Engineer of 2020 (E2020) must possess key attributes, such as strong analytical skills, practical ingenuity, creativity, communication skills, be lifelong learners, be dynamic, agile, resilient, and flexible, ethical, leadership skills, professional, and business and management skills [12]. Polmear et al., [13] studied the impacts of out-of-class engagement activities on the attainment of E2020 outcomes for civil engineering students. They state that out-of-class engagement activities are extremely important, especially for underrepresented student groups. Simmons et al., [2] reported that engineering students identified jobs and sports as the top out-of-class activities. Humanities, arts, environment, and civic life were identified less frequently as top activities. For civil engineers, reduction of free time was found to be the most common perceived negative outcome of out-of-class participation, while personal development was the most common positive outcome.

Methodology

The CEOE (Civil, Environmental, and Ocean Engineering) department initiated several academic and career events to benefit the professional development of the department's undergraduate students. The relation between out of classroom activities, held at the department level, and student GPA is analyzed. Trends in GPAs, both before and after each semester in the 2023-2024 academic year, and attendance rates were studied. These trends were further studied by cohort academic level, participants in the cooperative learning program, and student athletes. The data was analyzed for its impacts and to inform future planning.

The present study seeks to contribute to this body of literature by offering an investigation of the relation between department hosted out of classroom engagement activities and student GPAs for undergraduate students majoring in civil, environmental, or naval engineering. The phrase "out-of-class" is used by the authors to describe any student activity which takes place during the day, outside of scheduled class time. All such events were organized and hosted by the department. Each event was communicated to students through a variety of methods, including university email, a department canvas page, monthly advising bulletins, and social media.

Twenty-one events were held during the 2023-2024 academic year, with ten in the fall and eleven in the spring. The department focused on hosting events which fit into one of five categories of events: career development, community building, physical activity/sport, academic support, and field trips (Table 1). The objective was to ensure that students were provided with a wide range of events to attend based on their interests and self-identified needs.

Table 1 – Number of Events by Category

Category	Number of Events
Career Development	11
Community Building	3
Physical Activity/Sport	1
Academic Support	4

Field Trips	2

The purpose of this study is to investigate the relationship between student academic performance, measured through GPA, and student engagement with their academic department's out of the classroom experiences, measured through the number of events a student attended in an academic year.

Results and Discussion

In the 2023-2024 academic year, the department's undergraduate enrollment totaled 257 students, of whom 199 students (77.4%) attended at least one event. 133 students (51.8%) attended 2 or more events, and 87 (33.9%) students attended 3 or more events. The attendance rate was significantly higher for graduating seniors compared to juniors, sophomores or first year students (Table 2). The p-values for Z-tests comparing seniors attending one or more events to those of juniors, sophomores and first year students were 0.0028, 0.0041, and 0.0092.

Table 2 – Attendance by Cohort

Academic Year	Attendance Rate
Seniors	90.20% (46/51)
Juniors	68.75% (44/64)
Sophomores	76.31% (58/76)
First Years	72.72% (46/66)

The spring 2024 average GPA of students who attended at least one event in the academic year was 3.51 compared to 3.22 for the non-attendees (p-value=0.0003). The average GPA was 3.53 for students attending at least 2 events and 3.55 for students attending at least 3 events, indicating a small increase. However, the t-test does not indicate any statistical significance to these differences.

GPA vs Event Attendance

No. of Events Attended	F23 GPA Average	S24 GPA Average	F22 GPA Average	S23 GPA Average
0	3.21	3.23	3.33	3.38
1 or more	3.49	3.51	3.48	3.50
2 or more	3.50	3.53	3.52	3.53
3 or more	3.53	3.55	3.61	3.60

In comparison to fall 2023, the average GPA for all groups increased in spring 2024. The trend was similar for first year students, where the non-attendees averaged 3.22 compared to the attendees who averaged 3.53. Similar trends hold for students in the 2022-2023 academic year.

Categorizing by types of events, the average GPA of 17 students who attended only career events was 3.46, 31 students who attended only community events was 3.59, 21 students who attended only academic events was 3.41, and one student who only attended a trip was 3.68. No student attended only a physical event. It appears that community events had the strongest correlation with strong academic performance.

GPA By Event Type for Students Who Attended Only One Category of Events

Event Category	Number of Students Who Only Attended One Category	Average AY 23-24 GPA of Students Who Only Attended One Category
Career Development	17	3.46
Community Building	31	3.59
Academic Support	21	3.41
Trip	1	3.68
Physical Activity	0	-

Among students who participate in the cooperative education program, the average GPA of the 15 attendees was 3.67, compared to 3.52 for the seven non-attendees. This difference is not statistically significant. However, this is likely due to low sample sizes. Among student athletes the average GPA of 13 attendees to events was 3.52 compared to 3.49 for the eleven non-attendees, suggesting no statistically significant difference.

GPA By Special Population

Population	Number of Attendees	Average GPA of Attendees	Number of Non-Attendees	Average GPA of Non-Attendees
Co-Op Students	15	3.67	7	3.52
Student Athletes	13	3.52	11	3.49
International Students	4	3.20	1	1.85

Junior (64.58%) and senior (76.47%) students attended more career focused events than the average (60.30%). This could be attributed to these students approaching graduation and seeking careers, internships, and post-graduation mentorship at a higher likelihood than their underclass peers. Likewise, they may be interested in seeing how their upper-level engineering courses apply to real world engineering design, which was a frequent topic within career focused events.

Senior (68.63%) students attended more community building activities than any other academic level and compared to the average (43.72%). While this may be because this cohort of students has attended the university the longest and, as such, has a strong network of peers and feels most comfortable attending a social event. This attendance can assist the department in establishing strong connections with these soon to be graduating students. This may help them, as alumni, remain engaged with the department and assist in future events, especially related to career development and mentorship.

Senior Students vs. Average

Event Type	Number of Senior Attendees	% of Seniors Who Attended At Least One Event	Average % of Students Who Attended At Least One Event
Academic Support	9	17.65%	29.15%
Career Development	39	76.47%	60.30%
Community Building	35	74.47%	43.72%
Physical Activity	12	23.53%	11.56%
Trip	12	23.53%	13.57%

The positive association between student performance and event attendance may suggest that either high performing students are inclined to attend more events or that attending events helps in increasing student GPA. Either hypothesis, or both, could be wholly or partially true. It seems reasonable to assume that attending events will increase students' social and networking skills and therefore result in increased confidence. As a result, these students could have more sources of help when faced with a problem or searching for a resource; for example, when solving a homework problem, preparing for an exam, or looking for an internship. Similarly, not attending an event may serve as an indicator that a student is struggling academically. An outreach program to connect with the most underperforming students and having them participate in events might help them.

Literature Review

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