

## **Procedures and Outcomes of an Engineering Living - Learning Community**

**Mrs. Kristin Brewster, West Virginia University**

Kristin Brewster is currently the Curricular Outreach Program Coordinator for the Fundamentals of Engineering Program in the Benjamin M. Statler College of Engineering and Mineral Resources at West Virginia University. She graduated from WVU in 2011 with a B.A. in Mathematics and a M.A. in Secondary Education. She has taught spatial visualization, engineering first year seminar, engineering in history and freshman engineering problem solving courses. In addition, she advises freshmen students to help with the transition from high school to college and provides academic support.

**Patrick O'Donnell**

# Procedures and Outcomes of an Engineering Living-Learning Community

## Abstract

At a university serving around 21,000 undergraduate students, a first-year engineering program partnered with the campus residence life to create an Engineering Living – Learning Community. The goal of this program is to allow students in a certain major to live and learn with their peers. Learning opportunities come from common curriculum and strategic programming, which is developed in tandem by the Residence Hall Coordinator for the building and the engineering faculty partner in the first-year engineering program. The Engineering Living-Learning Community serves around 250 students each year (5 floors of 50 students) out of around 900 first time freshman engineering students. This program is now in its third year of implementation and some of the outcomes include: waiting lists for participation in Living- Learning Community, increased student involvement in LLC, and noted higher overall GPA data when compared to other first-year engineering students. The purpose of this paper is to highlight the organization of the engineering Living-Learning Community and programs (House Cup / Running of the Bulls, tutoring opportunities, etc.) that have contributed to recent results.

## Introduction

In the fall of 2017, a mid-sized Atlantic university created Living – Learning Communities (LLCs) to allow mostly freshman students in specific majors to live and network together in residence complexes across campus. One of those was specifically geared toward students studying in a common first year engineering program. The goal of the Engineering LLC was to give these students the opportunity to live with their peers, have better access to engineering faculty and to have more available access to unique opportunities to further knowledge for their major. Cumulative Grade Point Averages (GPAs) were logged and averaged at the end of each semester and used to influence programming initiatives for students. At the completion of the first year, the GPA of the students that lived in the LLC (2.55) was noted to be lower than that of an average student that was majoring in engineering but not in the LLC (2.75).

After receiving that data, the new goal of the Engineering LLC was to create programming to improve student GPAs so that students in this LLC would have a higher GPA than a student without the support of these special programs.

## Background

It is well known in the engineering education community that Living – Learning Communities support student academic performance. In addition to academics, LLCs also support student retention, engineering identity and access to engineering faculty. While each LLC across the country is operated differently, all have the same goal of helping students.

## Methodology and Programming Opportunities

Engineering LLC Council

The Engineering LLC Council is a collection of various constituents who come together to discuss programming efforts as well as any relevant topics as it pertains to the LLC. This group includes students living in the LLC, Resident Assistants (RAs) working in the LLC, the Residence Hall Coordinator (RHC), the Academic Partners, and a member of the Residence Life leadership team (either an Associate Director or Program Coordinator). These members, usually a group about the size of seven or eight members, meet on a bi-weekly basis in each semester. These meetings are conducted in two parts. The first half includes a review of the budget, discussion on events that had occurred since the previous meeting, events happening before the next meeting, and events happening in near future. The second half includes time for each constituent group (Students, RA, Residence Life Leadership, and Faculty/Staff) to discuss any topics they think are relevant or worth discussing amongst themselves. The RHC takes notes throughout the meeting of what is being discussed, in real-time in front of everyone, so that everything discussed is captured accurately. These minutes are made available to any students or staff interested in reading about what is discussed at the meetings.

### **Overall Programming**

#### **Tutoring**

As mentioned above, most students in the Engineering LLC are enrolled in a common first year experience. Part of the requirements of that program is to complete 6 core courses:

Engineering 191 – First Year Seminar

Engineering 101 – Engineering Problem Solving 1

Engineering 102 – Engineering Problem Solving 2

Mathematics 155 – Calculus

Chemistry 115 – Fundamentals of Chemistry

English 101 – English Composition

All of these core courses must be completed with a C or better and students must have a 2.25 cumulative GPA to move out of the common first year engineering program. The program also requires students to complete 2 supervised study hours each week as part of their grade in the aforementioned engineering courses.

To help students gain more convenient access to tutoring opportunities, in the fall of 2018 subject specific tutoring hours were established in the residence hall. Evenings for each subject were determined by university planned common exam times. For example, Chemistry 115 common exams were scheduled on Monday evenings from 7 – 9 pm so those tutoring sessions were scheduled on “off weeks” from exams.

Chemistry 115 was scheduled for Monday, Mathematics 155 (Calculus) was scheduled for Tuesday evenings and Mathematics 153 / 154 (Calculus Part 1 & 2) was scheduled for Thursday evenings. These subjects were chosen since the majority of students in the Engineering LLC were enrolled in those courses.

In the spring of 2019, tutoring was expanded to cover Physics 111 (General Physics) and Mathematics 156 (Calculus 2) as those were classes that the majority of the students typically take in the spring semester.

### House Cup / Running of the Bulls

In the spring of 2019, the Engineering LLC House Cup was established. The purpose of this program was to provoke some healthy competition between the five floors in the residence hall to impress the importance of being engaged in LLC activities.

One point was earned for each study hour that a student attended, except for the LLC specific generic tutoring sessions on Sunday from 7-9 in which a student could earn 2 points for their floor. Students could also earn two points for attending LLC sponsored events. Fifty points were earned by the floor that had the highest average GPA at midterm. This program was started in the spring semester so students were also encouraged to outperform GPA data from the fall semester. The average of letter grades were determined for each floor and could earn points for earning more / less of those grades. Each floor could earn 25 points for earning more A grades than they did the previous semester and 20 points for Bs. If a floor earned fewer Ds & Fs, they would be awarded 10 points.

Students were also able to earn points for their floor through the Running of the Bulls program coordinated by the Residence Hall Coordinator (RHC).

Succeeding in the classroom can often appear to be an individual achievement. Running of the Bulls looks to shift that to a larger view of how students as a community are succeeding and celebrating academic success whenever possible. The title of the event can change depending on the community. Previous iterations at other universities included "Goal Ball Machine," and "A's for April Hall." The mascot for Braxton Tower, where the Engineering LLC is located, is a bull. Therefore, the competition was dubbed, "Running of the Bulls." Students can see how their peers they live with, both on their floor and on surrounding floors, are performing academically. This positive reinforcement will, hopefully, encourage the students to also celebrate their own success. Participation in this event is entirely voluntarily. Assessment is derived from the participation from each floor. Weekly updates keep the event fresh in the minds of students.

Each semester, a spreadsheet is created to track grades from students, including the following: floor, first name, last name, class title and number, the point value, the type of assignments, the grade they received, the date the assignment was graded, and the date the grade was recorded. The grades included are: quizzes, test, papers, projects, presentations, exams, and lab reports. Grades can be e-mailed or turned-in in-person to the RHC.

Grades must be 85% or higher, or a B+ or higher on a letter scale. Grades are then multiplied for classes of 200, 300, or 400 level. This is to incentivize upperclassmen (RAs or returning students) to participate as well as reward students who are taking harder, upper level classes. Grades are not accepted after one month of being graded to prevent floors from stacking grades for months on end and then delivering a mountain of extra work/grades on the RHC at the very end of the semester.

Each time the RHC receives an e-mail or grade in-person, they are checked for authenticity to reduce cheating. At a given time each week, the scores are tabulated, updated and e-mailed out to the building. A life-size scoreboard is plastered across from the elevators so that students can see the latest scores each week and keep up with how their floor is performing in relation to others in the building. It is also important to note that Running of the Bulls is a program that was already established for use of the whole building whereas the LLC is only part of that building. The House Cup is a competition only among LLC floors.

### **Semester Specific Programming**

The Engineering LLC Community Council strives to create programming that is relevant to the students in the Engineering LLC. As such, the programming offered each semester is influenced heavily by availability of opportunities, student interest/suggestions and educational value. Below are some examples of programming from past semesters.

#### **Fall 2018**

The semester started by welcoming students to campus with a Welcome Event. The idea was to help students identify with the Engineering LLC early to help them form friendships in their major. This event happened in the first two weeks after move in weekend. At this event, students had access to pizza, various yard games and music. Faculty and Staff in the first year engineering program were also invited to bring their families and meet the new students in the LLC.

The second event of the semester was to attend an escape room. The thought process behind this was to give the students a team building opportunity since teamwork is integral to becoming an engineer. This event took place in the second month of the semester.

Throughout the semester the students were invited to attend movie nights. At these events, snacks were provided (popcorn, s'mores, soda, etc.). The first movie that the LLC watched was *Avengers Infinity War* which had just been released the previous week. The second movie was *October Sky* which was watched on a projector screen outside while students made s'mores. For the third movie, students were shuttled to the local movie theater to watch *First Man*. Transportation and ticket fees were taken out of the LLC budget so that there was no cost to students (unless they wanted snacks).

The Office of Housing and Residence Life created t-shirts for each LLC. To distribute the t-shirts, the Engineering LLC Council arranged a watch party for an away football game. At this event, students were provided with pizza, soda and water.

#### **Spring 2019**

During the spring semester, programming opportunities are limited by weather conditions. Many events needed to be indoors for students to be able to participate.

The first event of the semester was to take students to a local Trampoline Park as a way to "jump into the new semester." The admission fees were covered by the LLC budget for students that were interested in attending.

For the second event of the semester, the Engineering LLC Council sponsored an Academic Achievement Dinner to celebrate students who earned above a 3.5 semester GPA for the Fall 2018 semester. Originally this event was planned for President's list and Dean's list students, but there were some students who had earned the GPA to be on those lists but weren't included for various reasons.

Resident Assistants alerted the Engineering LLC Council that many students wanted to attend a WVU Hockey Game. So transportation was organized to take the students to the local ice area for the match. One of the students in the Engineering LLC was on the hockey team this semester.

This semester the Engineering LLC students were very interested in the Marvel movies. The students suggested going to see *Captain Marvel* at the movie theater. The LLC Council arranged transportation and tickets for students that indicated that they wanted to attend. This decision was supported by the LLC Council because it promoted teamwork.

In April the Engineering LLC took a trip to Pittsburgh (about 1.5 hours away) to go to the Carnegie Science Center and Museum. This was chosen because there was a special exhibit at the museum celebrating the life and innovations of Leonardo DaVinci. As he is considered one of the first engineers, the LLC Council thought that students would benefit seeing what DaVinci accomplished in his lifetime with limited resources. While in Pittsburgh, the students also went on a tour and rode the historic Duquesne Incline. Since the trip took the majority of the day, the LLC partners (faculty and RHC) treated the students to dinner at Buca di Beppo.

At the end of each year, students are asked to declare their intended major so that when they meet the requirements of the first year engineering program, they can be moved to the appropriate major. The intent of this event was to allow students to meet faculty in their new majors. We provided food, laptops for students to fill out the major declaration form and large picture frames that students could take photos with to denote their major.

#### Fall 2019

To start off a new academic year, the Engineering LLC partners (faculty and RHC) instituted written goals for the Engineering Living – Learning Community. These goals were that all programming should be:

- Tied to goals of the first year engineering program
- Life skills for being an Engineer
- Supporting and celebrating Academic Achievement

In the spirit of those goals, all programming was evaluated and made to align with one or more of the goals. When creating programming for individual floors, Residence Assistants (RAs) were encouraged to reference the goals for guidance.

Like the fall of 2018, the first event of the semester was a Welcome Event. The event details were much the same. The exception was that prior to the event, students were given a paper

invitation and an LLC branded water bottle. Also at the event, students were given a presentation by the faculty partner and RHC to welcome them and explain the purpose and goals of the Engineering LLC.

One initiative of the university the Common Read. All students are expected to read the same book as selected by the university. This year's Common Read was *Educated* by Tara Westover. To support the programming of the university, the interest of the students and the goals of the LLC, the Engineering LLC Council put together an event where students would watch *Captain Marvel* and then the RHC and faculty partner compared major themes in the movie to themes in the book.

The Engineering LLC students attended the escape room as the third event. This event was edited to include a debriefing on how the skills they utilized in the escape room were relevant skills that they would need in engineering.

One of the LLC RAs and students on the Engineering LLC Council brought up an issue that was current with students on the all-female floor of the LLC. Which led to a program being developed in conjunction with the campus chapter of the Society of Women Engineers (SWE) to address issues that females in a STEM field sometimes face. The idea was to facilitate a discussion between upper classmen and freshman students about some of these issues.

A new event / program during the fall semester of 2019 was a "First Exam Spirit Week." In past semesters, many students would be caught off-guard with all of their exams happening in one week. To help prevent this occurrence, the Engineering LLC Council organized a spirit week to bring awareness to the upcoming exams and how to study for them. Attendance at evening study sessions was encouraged by providing snacks and study materials.

## **Data Collection**

Semester GPA data was collected from current residents of the Engineering Living – Learning Community at the end of each semester. It should be noted that there is a slight possibility that grades could be adjusted on a case by case basis but the LLC GPA data is not recalculated throughout the semester.

As the Engineering LLC has matured, so has the collection of data. The LLC now collects more data than was collected in the first year of the LLC. We have

## **Results**

Data presented in Table 1 shows average term GPA data for the Engineering Living-Learning Community every semester from Fall 2017 to Fall 2019. It also shows the average term GPA for first time freshman engineering students who were eligible to live in the Engineering Living – Learning Community but chose not to be part of that or any (Honors) LLC. This data also includes commuter students that have declared engineering as their major.

Table 1: Average GPA Data by semester for LLC and non LLC students in Engineering

Semester	Engineering LLC Average GPA	Engineering (not in any LLC)
Fall 2017	2.59	*data not collected
Spring 2018	2.55	2.75
Fall 2018	2.64	2.471
Spring 2019	2.53	2.56
Fall 2019	2.77	2.60

## Discussion

After analyzing the data, it looks like in the fall semesters students in the Engineering LLC outperform engineering students that are not in a living-learning community on campus. Conversely those students outperform the Engineering LLC students in the spring semesters. It should be noted that in the spring of 2019, the average Engineering LLC student only underperformed the average freshman engineering student by 3 hundredths of a point.

It would be easy to attribute a drop in the GPA for the spring semesters to the students taking more difficult classes. However, all students would likely be taking more difficult classes in the second semester, so it's not a reason for the Engineering LLC GPA specifically to be lower.

It is encouraging that each fall semester GPA has been higher than the fall of the previous year. This change could be attributed to new programming that was revolved around academics. Credit for this change could also be given to the fact that each fall the LLCs get a new group of students. Since spots are limited to the first students that sign up, students that achieve higher academically could have been recruited.

Even though the Engineering LLC Council is constantly reflecting on past and current practices, it's hard to draw a correlation between programming and student achievement.

## Conclusion

As with many programs within Residence Life, it's hard to pinpoint exactly what effects student performance or data. However, with the rising average GPA each fall, its hard to deny that something is affecting the students in the Engineering Living – Learning Community in a positive way. The LLC Council would like to attribute this change to academically bound programming. To further research these outcomes, more metrics such as student attendance data and individual student GPAs are needed to draw a definitive conclusion. Also, since this program is only in its 3<sup>rd</sup> year, graduation/retention/persistence data is not yet available. Once that data is published by the university, analysis will be conducted to see if living in the Engineering LLC at this institution might be one of many contributing factors.