

# **Review of Living Learning Communities and their impact on first year engineering college students**

## **Abstract**

Traditionally, first-year college students do not have a community of like-minded peers with whom they are able to learn. Adding to first-year engineering college students' (FYECS) struggles is the fact that many students do not have a mentor in their related field and are unable to start building their professional repertoire, network, and/or practical skills. Living Learning Communities (LLC) can offer a platform for postsecondary institutions to increase recruitment, engagement, and sense of belonging for students who live in an LLC. LLCs have been described in the literature as themed living and learning communities where students take a common course(s), participate in extracurricular activities with one another, and live in the same residence hall. This literature review examined relevant published work on 1) What impacts do LLCs have for all students who live in an LLC; 2) What are the impacts on first-year engineering college students living in an LLC, and 3) What theoretical frameworks are used in literature when examining the impacts an LLC has on first-year engineering college students.

## **Introduction**

Two of every three students in Singapore, and one out of every two students in China obtain degrees in science or engineering. In the United States, that statistic is less than one in seven students who earn degrees in science or engineering [1]. Given the growing world of science and technology, the demand for science, technology, engineering and math (STEM) graduates is increasing, yet only half of the students remain with their degree. It is becoming increasingly important to increase retention rates of students earning degrees in STEM, and higher education needs to come up with innovative and effective strategies to increase students' success.

In order for students to find success within their chosen major, they need to build a support system. First-year college students often struggle because they do not have a community of like-minded peers with whom they are able to learn from and first-year engineering college students often do not have a community of other engineers with whom they can increase their sense of belonging and content knowledge [2]. However, having a support system of like-minded peers is not the only resource required for student success. First-year college students also may not have a mentor in their related field, and are unable to start building their professional repertoire, network, or practical skills.

One increasingly common method to increase student retention at four-year universities is the implementation of a Living Learning Community (LLC). The origin of LLCs can be drawn from social clubs at Oxford and Cambridge that ultimately resulted in similar, intentional learning communities at Harvard, Yale, and Princeton [3]. Engineering specific communities can be found at 149 of 356 four year universities with engineering colleges [4].

LLCs can take on many forms, but they typically consist of a group of students of the same or similar majors assigned to live together in a residence hall. With their shared subject interest, those students typically are taking similar courses. Many LLCs also require all residents to take a

common course, attend community building activities together, or work on projects together [5]. LLCs also tend to offer additional resources including a faculty in residence, a staff of older students to study with, department engagement events, and required advising.

One example of an engineering LLC is at a four-year public university in the Pacific Northwest. This particular LLC houses roughly 68 first-year students per year in a coed residence hall. Participants are required to take a 1 credit hour course each semester in association with the LLC, where they cover topics regarding professional development and how to succeed in engineering school, along with completing a group design project. This LLC houses a faculty-in-residence, where an engineering faculty and their family reside in the residence hall and is always available as a resource. The FYECS living in the LLC also have access to numerous resources due to their participation, including study nights, holiday-themed social events, and evenings with faculty members [5].

### **Impacts on students living in an LLC**

Moving to college and living on-campus can be a difficult transition for many students. For most traditional students, it is the first time they've lived away from home, and now they've been exposed to a new community where they likely don't know anyone. Regardless of a student's major, LLCs can help alleviate the struggles of that transition. By fostering a community of like-minded and similarly passionate individuals, students that participate in a LLC experience a smoother transition during their first-year of college. Activities like group study sessions and meetings with faculty are positive indicators of a student's successful academic transition [6].

LLCs are designed to provide participants with social and academic benefits. Through their shared living space, most LLC participants ultimately live, eat, socialize, and study with a common group of people. Interacting with their peers is widely suggested to be the most important factor in student development. Not having a study group of students in a common major can be a significant factor as to why students leave the STEM fields [7]. LLCs relieve students struggle to find a study group, due to the peers in the same major are living with one another. Research has found that LLC participants study more in groups than non-participants, and thus feel more supported in their living environments than students who live in traditional on-campus housing [8].

In a 2018 study conducted by researchers at Oklahoma State University, first year students living in an LLC reported that their participation exposed them to new experiences, introduced them to new people, and ultimately contributed to their personal growth and development [3]. Another major benefit of LLCs demonstrated in this study is that LLC participants reported feeling more comfortable approaching faculty members [3]. Having a relationship with faculty members has multiple benefits, including finding a mentor in their field [9], having a greater sense of satisfaction with their educational experience [9], and creating a connection to the university and relevant department [4].

## **Impacts of an LLC on first-year engineering college students**

Students may leave school for a variety of personal or familial reasons, but students who specifically leave the STEM fields tend not to differ from retained students in their academic abilities. Rather, students leave based on the complexity of the content, or a disinterest in the field in general [10]. Across the US, only 57% of students who start as engineering majors actually complete their engineering degree [11]. It has been reported that there are three main factors that determine whether or not a student persists with engineering: academic success, commitment to the college of engineering, and commitment to learning engineering. Participation in a LLC during their first year of college can help solidify all three of those components [10].

The first year of college can be difficult for students academically as the transition from high school to higher education can be a challenge. This challenge can be attributed to the drastic differences between the two learning environments. In a study done by researchers from the University of New Haven, they looked into how study habits differed between LLC participants and non-participants. After surveying their students, they found that 65% of students who lived in the engineering LLC regularly studied in groups, while only 39% of non-participants studied in groups. Among the participants who stated they regularly study in groups, 88% of them said that their study group consisted of other engineering LLC residents [2]. Adding to students' academic success, many LLCs have upper-division students residents to serve as mentors and tutors, and can provide advice on how to be successful in their classes [1].

Every LLC is structured differently, however nearly all of them have programs in place that help participants foster a relationship with the college of engineering. One method of creating relationship is by providing participants with opportunities to get to know faculty outside of the classroom. Residential colleges and LLCs often include a faculty-in-residence, where a faculty member and possibly their family live in the residence halls with students, or they are able to place a faculty member's office within the residential college. It has also been found that engineering students who live in LLCs report more meaningful interactions with faculty [12].

Interaction with peers is considered one of the most important factors in student development [7]. In a study at Washington State University, researchers compared the activities and interactions of STEM students who lived in the STEM LLC, Gannon-Goldsworthy, with STEM students who either lived off-campus or in other residence halls. While they found that the LLC participants spent more time studying with their peers, one of the most interesting outcomes of the research was in regards to the students' confidence with their choice of major. The majority of the students who lived in the LLC and studied with their peers were confident in their decision to study engineering. However, the students whose group of friends consisted of mostly non-engineering students tended to leave engineering [7]. This shows that a student's social group plays a part in their academic confidence, and by participating in the LLC, those social groups will be easier to form.

## **Theoretical Frameworks used to examine impacts LLCs have on FYECS**

Tinto's Interactionist Theory of Student Departure is a common theoretical framework used to analyze why students leave college [2], [3], [9], [11], [13]. Tinto believes students' success in college is based upon their preparation for higher education, and their environment in college [14]. Tinto's research found that LLCs tend to create their own support groups, and spend more time outside of class together than non-participants. This type of supportive relationship proves that LLC participants gain more than just a deeper understanding of their course material [9].

Similarly, Social Cognitive Career Theory (SCCT) from Lent, Brown, and Hackett is used to examine how people develop and pursue their career and academic interests [1]. SCCT looks into how three separate variables affect a student's career aspirations: self-efficacy, outcome expectations, and goals. When specifically applied to STEM students, researchers incorporate three more topics into the framework; students' interest in STEM, the presence of social supports, and barriers [1]. When analyzing the success of engineering LLCs through the SCCT lens, LLCs have a rich, positive impact on students and their desire to pursue a career in engineering. After studying over 45,000 undergraduate students through the lens of SCCT, LLC participants experience more social and academic support, which ultimately leads to an easier college transition, higher confidence, and they more so feel like they belong in their university [1].

## **Discussion and Conclusion**

In conclusion, LLCs are effective at improving the experience of FYECS. Engineering LLCs improve the students' experience with both added social and academic benefits. The average size of an engineering LLC across the United States is 146 students, with 43% of them larger than 75 students [4]. This relatively small community, compared to the entire class of incoming first year students, allows students to get to know each other and form their own study groups.

Engineering LLCs can be structured to appeal to the entire engineering population, or they may target a specific group of students. Engineering LLCs that are designed for women or minority groups, however, do tend to have higher retention rates than those open to all engineering students [4]. In order to help FYECS build a relationship with their college or department, LLCs are encouraged to implement faculty into the community design. These faculty members may reside within the community, serving as a constant resource and connection to the university, or they may simply locate their office within the residential college, making it easier to foster faculty-student interactions [12].

Another method of providing resources to students may include the implementation of a common course [5], [9], [15], [16]. This may be a course entirely built around the LLC, where FYECS discuss adjusting to the university, and how to succeed in school [5], [16]. The common course may also just require participants to enroll in the same section of a university required course, which encourages students to form study groups and makes for a welcoming learning environment [15].

The impacts of LLCs on first-year students have been analyzed through the lenses of two different theoretical frameworks. In Tinto's Interactionist Theory of Student Departure, Tinto believes that student success is based on their preparation for higher education, and their environment in college [2], [3], [9], [11], [13], [14]. The other theoretical framework used is the Social Cognitive Career Theory (SCCT) from Lent, Brown, and Hackett [1]. This framework asserts that three variables, self-efficacy, outcome expectations, and goals, affect a student's career aspirations. Through this lens, it was found that engineering LLC participants experience an easier college transition, higher levels of confidence, and a stronger sense of belonging within the university [1].

Overall, LLCs provide a positive environment for FYECS, and students tend to be grateful for their experience. Surveys have shown that the majority, if not all, participants would have still chosen to participate in their LLC if given the chance, and students who chose not to participate tend to regret that decision [2]. While LLCs provide plenty of resources and opportunities to FYECS, they also provide lasting impacts on a student's undergraduate career through the relationships and habits that they form. LLC participants tend to remain friends with and study with their fellow participants, meaning that students make decisions in their first year that continue to provide positive benefits until they graduate [2].

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