



Understanding Students' Experiences in a STEM Living-Learning Community



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THE RETENTION AND GRADUATION OF COLLEGE STUDENTS in the science, technology, engineering, and math (STEM) fields is critical to the continued development of the United States. Many students in the U.S. who begin college in a STEM field do not end up graduating with such a degree. There are many strategies to improve the retention and graduation rates of STEM students, with living-learning communities (LLCs) being one of them. LLCs positively impact students' retention both at the institution and in the STEM fields; however, less is known about the potential disadvantages of such communities. After interviewing 23 former STEM students who participated in a living-learning community during their first year of college, we found academic, personal, and social advantages and challenges for those who participated in an LLC community.

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The retention and graduation of college students remains an important and integral part of the mission of higher education, particularly in science, technology, engineering, and math (STEM). In the United States, many students who begin college with the hopes of earning a degree in this field ultimately graduate with a non-STEM baccalaureate degree (Change the Equation, 2015; U.S. Department of Education, 2009). Keeping up with other countries in terms of educating students in these critical areas will be a challenge for the United States in the future, as more and more individuals within this field are graduating in other countries. In Singapore, for example, one of three graduates receives a college degree in STEM; in China, it is one of every two individuals. With only one of seven in the United States graduating with a STEM baccalaureate degree, it is important to create systems and programs to increase the number of these students and then to retain them. Although there are many programs to help STEM students transition to college and ultimately persist to graduation, living-learning communities (LLCs) in particular have a significant positive impact on retention not only at the institution, but also in the field (Sriram & Shushok, 2010).

Many of the students who initially pursue the science, technology, engineering, and mathematics fields do not graduate with degrees in those majors, but LLCs can offer them academic and social benefits that will increase retention.

Living-learning communities—although not defined as such initially—have existed informally since the beginning of higher education in the United States. With the founding of Harvard in 1636, faculty and students lived and learned together. This was philosophically and pedagogically a part of the English system of education that the U.S. adopted and modified (Thelin, 2004). Today LLCs take many different forms, from interest or thematic communities and first-year experience programs to programmatic residency-based initiatives (Sriram & Shushok, 2010; Whitcher-Skinner, Dees, & Watkins, 2017). Although LLCs can look different from campus to campus, the tenets of many LLCs involve cultivating intentional interactions with faculty, requiring residency, and fostering social and academic learning.

Today, LLCs have become more widespread as faculty and staff pursue effective ways of enhancing the curriculum and building community among teachers and students (Sriram & Shushok, 2010). LLCs help students feel connected to their institution, which can reduce attrition rates. Although LLCs were developed to increase student retention, the benefits expand beyond graduation rates.

BENEFITS OF LIVING-LEARNING COMMUNITIES

There are many benefits of LLCs for students and colleges alike (Garrett & Zabriskie, 2004; Sriram & Shushok, 2010; Stier, 2014). For example, students who participate in these communities often have higher GPAs and spend more time in study groups preparing for class and tests (Hernandez, Schultz, Estrada, Woodcock, & Chance, 2013; Kuh & Hu, 2001).

As part of many LLCs, students have shared course experiences with others having similar academic interests, increasing the potential that they will form study groups in their residence halls. In addition, faculty are often assigned to oversee or live within an LLC. This supervision helps students form meaningful connections with professors outside of the classroom, making it more likely that they will persist and graduate (Pascarella & Terenzini, 2005).

Engagement with faculty and interacting with them in informal ways can result in increased confidence to approach them for help (Garrett & Zabriskie, 2004). In addition, faculty often hold office hours in LLC residence halls, providing more opportunities for students to make and build connections with professors in their programs. Formal and informal connections with faculty can increase students' satisfaction with where they live and with their college community.

IMPORTANCE OF LLCs FOR STEM STUDENTS

Beyond the general benefits of these communities, LLCs can be even more influential and pivotal for the success of STEM students in particular. Many of the students who initially pursue the science, technology, engineering, and mathematics fields do not graduate with degrees in those majors (Change the Equation, 2015; U.S. Department of Education, 2009), but LLCs can offer them academic and social benefits that will increase retention (Lardner, 2014). STEM-focused LLCs have a positive impact not only on GPAs, but also on academic satisfaction and support networks (Lardner, 2014; Sriram & Shushok, 2010). STEM stu-

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dents who conduct undergraduate research with faculty, an important component of STEM studies, are more satisfied and more likely to continue on to graduate school (Webber, Laird, & BrckaLorenz, 2013).

Although there is some information about living-learning communities and STEM students' experiences separately, there is limited research on their experiences within living-learning communities. Students pursuing degrees in STEM fields may experience higher levels of stress than do their peers in other fields (Lardner, 2014), so it is even more important that they experience a connection with and support from faculty and administrators. STEM majors are particularly difficult due to the technically complex material that students must master, and some students find themselves inadequately prepared for the rigor of the coursework (Malcom & Feder, 2016). Students interested in these fields often struggle with finding role models, applying classroom material, and finding opportunities for research (Jahn & Myers, 2014), challenges that often dissuade them from pursuing or continuing in STEM fields during college. LLCs help students build, develop, and maintain support networks and other resources neces-

sary for academic success. The ability to form study groups with others pursuing similar degrees, an important component of many LLCs, allows for more interaction and collaboration with peers and ultimately more time spent on academics (Lardner, 2014).

Yet even with the known benefits, there is still much to be explored about the outcomes of students who participate in LLCs, particularly those involved in STEM LLCs. In fact, some research alludes to potential negative outcomes for students in LLCs (Schussler & Fierros, 2008; Spanierman et al., 2013), but researchers have not fully explored this idea. There is also more to learn about the range of experiences of students who have participated in LLCs.

THEORETICAL FRAMEWORK

Although many studies address the purpose and utility of LLCs, the research is often tied to the importance of student involvement during college (Tinto, 1993). Some scholars have used Astin's (1993) theory of involvement to assess the outcomes associated with student development within the college environment. According to Astin's inputs-environment-outcomes (I-E-O) model, students come to college with inputs (e.g., their identity and previous experiences), and the college environment can shape and impact the outcomes. Understanding how the environment impacts students and their development is fundamental within this model, and it is often used as the rationale for living-learning programs (Dunn & Dean, 2013). We used Astin's I-E-O model in the current study to examine students' experiences related to the environment created by participation in the LLC. We wanted to understand how students perceived and interacted with the

LLC in order to determine how they were both positively and negatively impacted.

METHODS

Since our research question dealt with how students felt about their experiences in the LLC, we used interpretive, qualitative methods to find themes among students' experiences. Our project sought to understand the experiences of STEM majors who lived in an LLC during their first year of college. Thus, we adopted an inductive or emic approach, which allows behaviors to be described by participants, rather than using researchers' beliefs to understand meaning (Tracy, 2012). This STEM LLC was located at a small private school in the southwestern United States. Initially established in 2010 by a grant from the National Science Foundation, the LLC was developed specifically for students majoring in the natural sciences.

Site and Participants

All participants underwent an application process before joining the LLC as first-year undergraduates. All of them lived on the same floor of an on-campus residence hall during their first year, along with an upper-division student majoring in natural sciences who served as the resident assistant. In addition to living together, students participated in a variety of experiences as a cohort. For instance, they began their LLC experience with a one-week Freshman Accelerated Research Methods workshop, where they learned about research tools and methodologies in several scientific disciplines prior to beginning their undergraduate coursework. In their first year, LLC students completed two special science seminars and co-enrolled in the same sections

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of biology, chemistry, calculus, and computer science. LLC cohorts also received special benefits their first year of college, including a book stipend, free tutoring, and the opportunity to conduct undergraduate research after their first year in the program, an experience usually reserved for juniors and seniors. Although students were more actively involved in the LLC during their first year, the LLC director also offered recreational activities, community dinners, and research opportunities for each cohort during the remainder of their college experience. Many junior and senior LLC students later served as resident assistants and mentors to other LLC cohorts.

A total of 23 LLC students (86.7% response rate) participated in the current study. The LLC supervising faculty member initially contacted students to notify them about the study, and then we emailed them to solicit their participation. All participants were recent graduates of the university. Data were collected over two years so that two different cohorts of approximately 15 students each had the opportunity to participate in the study. Of the 23 participants, 16 identified as women and 7 participants identified as men. We assigned each participant a pseudonym to protect their anonymity.

Data Collection

One-on-one interviews with LLC students were conducted in a private faculty office on campus. In the open-ended interviews, students discussed why they applied to the LLC, the expectations they had, and how the LLC impacted their college experience. Students reflected on specific perks and the bonds they formed with other LLC participants and offered suggestions about how to strengthen or change the LLC program. Throughout the interviews, follow-up questions were asked to probe for more information and examples (Charmaz, 2006). The interviews were audio-recorded and transcribed.

Data Analysis

We analyzed interview transcripts through thematic analysis with an iterative approach (Tracy, 2012). We identified and compared various chunks of data comprising words, phrases, and sentences and then assigned emergent codes (Miles, Huberman, & Saldaña, 2013, p. 71). These open codes were then integrated to form broader themes (Glaser & Strauss, 1967). Although each author coded transcripts individually, we shared a codebook and periodically visited each other during the coding process to compare initial findings and determine if similar themes were forming. At the end of the coding process, we discussed similar categories, which formed the basis of the results presented here.

FINDINGS

After analyzing the data from the 23 interviews, we discovered three primary benefits and challenges related to the participants' LLC: academic, social, and personal. Although most

of the information about their LLC experience was positive, this research also highlights potential shortcomings of LLC involvement. These findings help us better understand the lived experiences of STEM students who participated and engaged in an LLC.

Academic Benefits and Challenges

One of the benefits and challenges that the participants noted was the LLC's influence on their academics. For some students, peer accountability benefited their schoolwork, whereas others noted an increase in their GPA because of the tutoring or study sessions held within the LLC. Many participants commented on the importance of their ability to conduct research with faculty, noting that this opportunity contributed to their persistence in STEM fields.

In many ways, students viewed the social element of the LLC as a highlight of their college experience. For many, the LLC was the primary mechanism through which they built friendships.

Academic benefits. Academics plays a large role in how students feel about their college experience and directly impacts a student's ability to remain at an institution. A positive academic experience can help a student persevere, which is even more important in the STEM fields (Potacco, 2015). More than half of the participants discussed feeling as though the other LLC students and faculty held them

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accountable for their coursework. One student shared how she would often see other students studying in the hall and would then form informal study groups. Alex stated, "It motivated me to do well . . . We always pushed each other to do well on the tests and [to] study together. Seeing other people succeed is also something that's another motivating force." Additionally, Hannah mentioned,

I've had one of my really good friends from the LLC, and we've had a lot of classes together. And I know that we count on each other for [a] lot. If I am like, "Are you going to get this done?" I know that she's going to get it done.

These examples demonstrate how accountability impacted students' commitment to their academics.

In addition to accountability, almost every participant commented on their grades and the benefits of tutoring while living in the LLC. Emily mentioned, "Because I got tutoring, it helped my grades so much. I went from a 45 to a 95 on the next test." For other students, it was not just the tutoring, but the interactions with each other that helped them academically. Luke stated,

I think [the LLC] really helped me academically. I think just being around the same people that were asking questions in class and talking to professors, and had some of the habits of success, really kind of set the expectations for me. And helped me push myself later on, and that was extraordinarily helpful.

Many students discussed the academic benefits in terms of studying, tutoring, and their peers pushing and encouraging them. Lucy summed up the academic benefits.

I actually liked it because we've been able to study together [and] form study groups. It isn't

as difficult when you've been in other classes [together] . . . and be like "hey, you want to study?" . . . When I meet with them, we ask each other questions, so that reinforces what we already learned.

Participants also spoke of the support received as part of the LLC and how that support encouraged them to continue in their difficult majors.

Benefits of research. Every student in the study noted the importance of conducting research with faculty, which is particularly important in STEM fields for acceptance into graduate school and lab positions. For Jack, working with a faculty member not only helped him academically, but also helped him solidify his career path.

Dr. Deal for bioinformatics came up and I was like "I wanna do that! That's it, right there!" and it helped me to focus in on what I wanted to do exactly. . . . It made things a lot easier on me so that I didn't have to go search it out myself, 'cause I knew if I had to do that I wouldn't have done summer research [and] it would've taken me longer to conduct research.

Students entering the STEM LLC were all required to take the one-week Freshman Accelerated Research Methods summer workshop, and many of them spoke about the academic benefits this initial shared class had on their

careers as students. Olivia echoed the fact that “the opportunity to see the different kinds of areas that you could go into . . . I definitely think that was the best part of that [one-week summer] class.”

Academic challenges. Although most participants mentioned the benefits of living in an LLC, there were some who encountered academic challenges with this experience. Some felt compelled to continue with STEM because they did not want to leave the LLC, even though their desired career trajectory changed. Others felt that the LLC was too academically competitive. Katie stated, “Towards the end, it got a little bit competitive to where, I mean, you’re all in the same classes, and we would help each other out, like ‘oh, do you not understand this part?’” She was not the only one who felt the tension among her peers to succeed. Grace mentioned, “Either you’re excelling really far and the people you are with are not getting as good of grades . . . but I think for the most part everyone brought each other up [and] made sure everyone was doing well.” Even though most people felt overwhelmingly positive about the LLC experience and its academic benefits, there were some who struggled with the competitive nature of the community.

Social Benefits and Challenges

In addition to discussing the academic component of the LLC, participants spoke at length about the benefits and challenges of social aspects of the community.

Social benefits. In many ways, students viewed the social element of the LLC as a highlight of their college experience. For many, the LLC was the primary mechanism through which they built friendships. Twenty participants

The LLC provided a place of connection for them; indeed, for most of them, the LLC provided the most meaningful source of identity.

(87%) shared how they made friends through the community, like Jack, who said, “the friends that I made in the LLC are the friends that I currently still have and all are my best friends.” Many participants referred to their cohort as “family,” attributing their strong friendships to living on the same residence hall floor together. Sophie recalled, “We just hung out together all the time, as family . . . We were just such a strong community . . . We would hang out in the lobby all the time. We brought furniture from outside and created this place to hang out.” Others felt that they built such strong friendships because they were all living away from home for the first time. Hannah commented, “most of my friends . . . are from the community because we [made] such a strong connection at the beginning when we were all missing home and going through this next chapter in your life.” In addition to living together and experiencing homesickness for the first time, participants bonded through organized LLC events and outings. Grace said, “[We] played games around the residence hall . . . bonding . . . that helped a lot.” Outings and activities were particularly helpful for introverted participants who felt uncomfortable actively seeking out friendships. Because these students shared a similar interest in science throughout their college experience, they were able to maintain friendships built in their first year. Charlotte summarized,

Shannon R. Dean · Stephanie L. Dailey

Those friends that I made . . . we are still friends now. We always hang out, and I know that I can go to them with my little science complaints that no one else can understand. I still have those initial friends, and they're my closest ones.

Another social benefit of the LLC community, beyond close companionship, was being able to take the same classes with their group of friends. Many participants, like Hannah, talked about collaborating with friends to align their course schedules so they could be partners in class. Even beyond their first year of living together, Olivia talked about taking classes with her LLC cohort, which made her coursework more fun. Participants also benefited from the social component of the LLC because the community forced them out of their comfort zones to meet diverse students. Melissa shared how she learned to interact with “very diverse personalities,” and Jack said the LLC offered him different social “perspectives with other students.”

Social challenges. Although the LLC provided an opportunity for camaraderie, taking classes with friends, and engaging in experiences with diverse perspectives, there were also several social challenges associated with the community. Thirteen students (57%) shared that the LLC created isolated friendships and inhibited their ability to bond with others outside the community. As Cullen admitted, “Because we had a tight group of friends, I didn't really branch out as much to other people.” Similarly, Luke shared that the LLC made it “harder to get outside advice and make connections across the different students” and that he “limited himself” by only making friends with other LLC students.

Interestingly, participants seemed aware of a stigma attached to being an LLC student. Emily said “they thought we were weird,” whereas Jana knew “people would describe us as clique-ish.” Hannah self-proclaimed the group as “antisocial” and “hated.” Sophie disclosed, “We were the big elite clique that knew everything . . . and a force to be reckoned with, I guess, looking from the outside.”

Both the emotional and physical closeness of the LLC students unintentionally created barriers for them to make friends outside of the community.

Many students in the LLC attributed their social isolation to the physical nature of their community, cut off from other floors in their building. As Jack described,

We all lived on that one floor, and it's kind of weird because it is an isolated island because it's not connected to any other floor. It's not easy to actually get to it . . . they're like “that's the island of science kids . . .” everyone on the floor is a science LLCer . . . you definitely stand out if you're not an LLCer . . . it's kind of hard to make other friends outside of it because you have to go to the other floors and meander around.

Harry stated that some LLC participants “wished they were more connected to more of the building or other people.” Both the emotional and physical closeness of the LLC stu-

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dents unintentionally created barriers for them to make friends outside of the community.

Another social drawback of the LLC was that many students often became annoyed with other students, and, because they were all part of the same community, they could not escape those with whom they had dissension. Several participants believed they got sick of fellow LLC students because of the sheer amount of time they spent together, like Holly, who complained of being “stuck with the same people . . . in the same routine.” Megan confided, “You go to the same classes, and you get friction. . . . People would get annoyed with each other because you saw them every day and especially being in a community together . . . science people are very high strung and uptight and wound up.”

Personal Benefits and Challenges

Although most of the participants reflected on the positive personal effects of the LLC, they also noted some limitations.

Personal benefits. Thirteen participants (57%) felt they benefited from the LLC because of the personal connections they made with faculty. Specifically, they indicated that their experiences in the LLC helped them feel more comfortable around professors so they could establish friendships with them. Luke suggested that informally interacting with faculty members during LLC activities, such as having lunch with professors, “took the intimidation factor out of it.” Similarly, Cameron joked that by eating with faculty members, he realized, “Oh, hey, you’re an actual person. You eat. I don’t have to be so scared . . . It helped me to ease my anxiety of talking to the professors.”

As relationships with faculty blossomed, LLC students felt that their professors genuinely cared about their well-being. Grace shared how faculty were “always asking how you’re doing,” and Erik commented, “If I haven’t been in class more than two days in two weeks, they’re like, ‘Are you okay? Is everything fine?’ I’m like, ‘Yes, I overslept!’” Because of these interactions, many professors became mentors to LLC students. Megan explained how one faculty member “became a mentor to me in every aspect of my life . . . Anytime I have good news, she’s the first person that I call, like my second mom.”

In addition to personally benefiting from relationships with faculty, 10 participants (43%) believed that the LLC eased their transition to college, allowing them to “find their place” and “establish ourselves” (Sophie). Others commented on how LLC participation “eased [their] anxiety coming to college . . . as a first-generation college student” (Cameron), helped with “getting adjusted to college” (Lucy), assisted them in “getting off the starting block” (Harry), and facilitated an “introduction to [the college town]” (William).

Participants seemed to be more personally involved on campus because of the LLC. Hannah explained that without the LLC,

I just don't think my résumé would be as long as it is. I've had so many opportunities because of the community . . . I don't think I would've done as much as I have done in these four years if I wasn't in the community. So, it's helped me tremendously.

Lucy also felt that “the LLC has helped me join organizations, like the Academy of Science [and] Women in Science.” Several participants also talked about their experiences as resident

assistants and how “being part of the LLC helped me [in] being an RA” (Makala).

Many in the LLC also noted that the community enhanced their writing skills. Emily proudly shared, “I couldn’t write well. Now I can write a paper within an hour. It’s exhausting, but it’s a lot easier.” Several students talked about how their field required a unique style of academic writing, which they were able to learn through mentorships and tutoring in the LLC. For instance, William learned how to “write a proposal manuscript, how science writing works, and how you can find additional research journals.” This was essential for many participants because “writing and communication skills are essential for a scientist” (Hannah).

Personal challenges. Although the LLC fostered personal development in terms of supporting participants’ connections with faculty, transitions to college, involvement on campus, and writing skills, it can sometimes detract from students’ personal development by making them feel siloed in their experiences. Ericka mentioned,

We are all pretty silo[ed]. We would interact with the tutors, and that’s about it. There were some people that interacted more with other members of cohorts, but I think they just sort of knew each other . . . from their hometown.

Participants rarely referenced extracurricular activities that were not affiliated with science, even when prompted. If they worked as residence hall assistants, they served the LLC community. Although several students in the LLC mentioned how the community strengthened their writing skills, the LLC did not seem to help develop such relational and

interpersonal skills as problem solving, collaboration, teamwork, and leadership, which students typically develop as part of cocurriculum involvement activities.

DISCUSSION

This study adds to the literature about STEM students by understanding how LLCs positively impact their academic, social, and personal lives, while also drawing attention to the challenges associated with these communities. Our findings demonstrate that an LLC is an environment that simultaneously fosters and inhibits the desired outcomes of both college and the LLC experience. This study aligns with much of the previous literature by acknowledging the positive gains students have from living in these communities but also notes some of the challenges of these homogenous communities.

Environmental Influences

According to Astin’s (1993) theory of involvement, the outcomes students demonstrate after college are directly related to the inputs (pre-college experiences) and environment. Although we do not know much about the extensive experiences students have before coming to our campuses, we do know that, as administrators and faculty in higher education, we can impact the environment, which can dramatically influence students’ experience and ultimately the outcomes associated with college. In this study, we found that the LLC environment significantly impacted students and that the LLC’s faculty and students played a considerable role in shaping the environment for these participants.

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Benefits for STEM Students

Most of the literature on LLCs highlights the academic benefits for students (Garrett & Zabriskie, 2004; Schussler & Fierros, 2008; Stier, 2014), which are even more relevant and necessary for those majoring in STEM fields (Sriram & Shushok, 2010). This study confirmed that these students felt similarly about the importance of providing space and time for academic connections with faculty and other students. Although the academic benefits played a large role in their satisfaction with the community, the social connections were also extremely beneficial and frequently discussed. For most of the students in our study, connecting with others through the LLC was perceived as more important than the academic benefits and most likely contributed to their retention. Participants also spoke of the support received as part of the LLC and how that support en-

couraged them to continue in their difficult majors. Although different LLCs have different purposes, it is important to examine each LLC to determine its goals and alignment. Is the purpose friendship, community, academics, or all of the above? Making sure that the goals are measurable will help each LLC to determine if the community is leading to its intended outcomes.

Participants also repeatedly noted their sense of attachment within the residence hall and the STEM field. The LLC provided a place of connection for them; indeed, for most of them, the LLC provided the most meaningful source of identity. Although a few were involved in clubs, organizations, or other things on campus, the living-learning community served as their main source of connection and friendship. The formal and informal interactions were pivotal in helping them acclimate and feel a sense of belonging among their peers and with faculty. This aligns with the literature about the benefits of LLCs in general, but also highlights the importance of this for students in STEM fields (Lardner, 2014; Sriram & Shushok, 2010). Participants' comments reveal that it is critical to not only help students establish relationships inside their LLCs, but also to challenge them to make friendships outside the community. Since many students change their major to a non-STEM related field after their first year (Change the Equation, 2015; U.S. Department of Education, 2009), having established relationships outside of the community will help their transition when they leave the LLC.

The most commonly found personal benefits of LLCs are often academic. The connection with faculty is obviously an important

component of the LLC, regardless of the type (Garrett & Zabriskie, 2004). Living near faculty gives students an increased confidence in their ability to approach them. Students discussed the importance of these relationships and the care and concern faculty and residents showed for each other within the community. Faculty relationships established through LLCs were not just beneficial for students academically, but also fostered personal development. For those interested in developing LLCs, it is imperative to consider intentional faculty involvement that moves past the traditional classroom experiences.

Challenges of LLCs

Despite theory and research demonstrating the powerful effect that college has on personal growth (Pascarella & Terenzini, 2005), LLC participants did not mention other aspects of college student development that is typically seen with cocurricular experiences. Growth in areas of problem solving, conflict resolution, teamwork, and leadership development is often fostered during involvement activities (Kuh, 1995), yet participants did not connect their experiences with becoming autonomous or learning independence, which was surprising considering prior research. Students discussed feeling siloed in the LLC, and not participating in many experiences outside the community may have contributed to their lack of exposure to other relational and interpersonal skills. There was not one participant who referenced learning about ethics, cultivating personal core values, or developing integrity through the LLC. In addition to academics, activities outside of the college classroom (e.g., involvement in student organizations) help students discover their purpose and develop

psychosocial skills (Kuh, 1995), yet they did not seem to attribute such development to the LLC, which diverges from other findings in this area.

Most of the participants remained actively involved with the LLC throughout their college years, and almost all of them graduated with a baccalaureate degree in a STEM field. Yet most of them had not secured plans post-graduation, at the time of the interviews. If students did not continue to work or attend graduate school in STEM fields, this is problematic, as the LLC would not have achieved its intended impact of promoting STEM advancement. However, it may be that students did continue in STEM fields post-graduation, even though they had not secured positions during the time of their interviews. We encourage future research to investigate this further. For faculty and practitioners within LLCs, it is important to provide students with opportunities for career exploration. These experiences may have helped students anticipate and prepare for post-college transitions.

LIMITATIONS

Although the findings from this study are valuable in helping better understand the experiences of STEM students in LLCs, there are limitations to this research. This study only examined STEM students in an LLC from a single institution; thus, findings are not generalizable, and it is still important to note that STEM LLC students' experiences at large public institutions may look vastly different than those at a smaller private university. Furthermore, we collected data from participants after they had completed their college experience. This has several positive attributes

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in terms of reflection; however, it might have limited students' ability to recollect specific details of their experiences. We also encourage future research to explore the relational and interpersonal development of students in LLCs. With STEM LLCs increasing in number across the U.S., further research should also examine the career trajectories of STEM students after leaving college to determine the long-term consequences of these LLC experiences.

IMPLICATIONS FOR FUTURE RESEARCH

One of the implications that is rarely discussed within the LLC literature is the challenges associated with these homogenous groups. Although there is little research on the potential negative outcomes for students living in LLCs (Spanierman et al., 2013), partly because the outcomes are overwhelmingly positive, it is important to note the siloed effect living in an LLC had for the participants. These difficulties can be addressed, but more research needs to be done to truly understand the challenges associated with these communities.

IMPLICATIONS FOR PRACTICE

Findings from this study have implications not only for future research, but also for student affairs practitioners. It is important to foster students' connections to the residence hall and community through intentional programming. Furthermore, providing opportunities for LLC students to connect with other students across campus is critical. This connection to the college helps LLC students develop a sense of belonging on campus, not just within the LLC. These external connections may be even more

critical for those involved in LLCs connected to intensive majors such as STEM, since students in these majors can often feel isolated from the rest of the campus environment.

Student affairs practitioners should also develop better transitional experiences for students who leave an LLC, since students who changed their majors often felt further isolation by having to leave the community. Allowing them to finish the remaining academic year in the LLC could aid in their transition, and creating more connections with others outside the LLC through programming or events could help them move from one residence hall to another or one major to another.

CONCLUSION

Living-learning programs are, on the whole, beneficial and show positive gains for students academically, personally, and socially—particularly for those involved in science, technology, engineering, and math fields. These environments foster connection to faculty, community, and the field of study. As such, faculty and staff must continually assess these communities and their benefits and challenges in order to foster the best learning environments for students. As colleges and universities strive to increase the retention and graduation rates of individuals in the STEM fields, living-learning communities are still one of the best retention efforts. It is essential to continue finding ways to enhance these students' experiences and foster belonging in both the field and the college.

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