

## **The Status of STEM Living Communities**

### **Mrs. Riley Sevan Harding, Indiana University-Purdue University of Indianapolis**

Riley Harding is a recent graduate from the Purdue School of Engineering and Technology, Indianapolis (IUPUI). Riley received a Bachelor's of Science degree in Organizational Leadership and Supervision as well as a certificate in Human Resources. She is currently working at John Wiley and Sons as an Associate Editor in Indianapolis. Riley conducted research on this subject for her senior project.

### **Prof. Patricia Fox, Indiana University-Purdue University of Indianapolis**

Professor Patricia Fox is a Clinical Assistant Professor in the Department of Technology Leadership and Communication in the Purdue School of Engineering and Technology at Indiana University-Purdue University Indianapolis (IUPUI). Pat has been a member of the faculty for over 32 years. She has previously served as Associate Chair and Associate Dean in the School. Pat teaches leadership, ethics, sustainability, and study abroad courses. She has held a number of leadership roles in the American Society for Engineering Education (ASEE) including four terms on the ASEE Board as well as serving two times as the Chair of Engineering Technology Council. Pat is a Fellow of ASEE. Her research interests include sustainability and study abroad education.

### **Dr. Charles McIntyre, Indiana University-Purdue University of Indianapolis**

Charles McIntyre is a Professor and Program Director of the Construction Engineering Management Technology Program at Indiana University Purdue University Indianapolis (IUPUI). He received a Ph.D. from Penn State in 1996. Prior to joining IUPUI, he was a faculty member and former chair in the Department of Construction Management and Engineering at North Dakota State University in Fargo. Dr. McIntyre's current research includes sustainable construction, green building, and industry-academic collaborations. He is an active member of the American Society for Engineering Education and the American Council for Construction Education. Dr. McIntyre has served on the ASEE Board of Directors and is an ASEE Fellow.

### **Ms. Terri L. Talbert-Hatch, Indiana University-Purdue University of Indianapolis**

Terri Talbert-Hatch, Ed.D. Associate Dean for Recruitment, Retention, and Student Services Purdue School of Engineering & Technology, IUPUI

Dr. Talbert-Hatch oversees the Student Services Office with responsibilities for undergraduate student recruitment and engagement, K-12 programming, career services, residential-based learning communities, scholarships, and student government for the School of Engineering and Technology. She works very closely with current students. She is responsible for the Commitment to Engineering Excellence program which is a university funded program that provides scholarships and research funding for underrepresented students in engineering and engineering technology programs. Dr. Talbert-Hatch is also a Co-PI on a recently funded NSF STEM grant that provides scholarships, academic support, and career planning for 2nd year students with unmet financial need who are enrolled in engineering programs.

# The Status of STEM Living Learning Communities

## Abstract

Virtually all institutions of higher learning have developed activities and/or academic programs in the Science, Technology, Engineering and Math disciplines, i.e., STEM. One specific program is called “STEM Living Learning Communities.” Living learning communities are a kind of co-registration or block scheduling that enables students to take courses together where the same students register for two or more courses, forming a sort of study team.<sup>1,3</sup> Living learning communities are defined as programs in which undergraduate students live together in a discrete portion of a residence hall or the entire hall and participate in academic and/or extra-curricular programming designed specifically for them.<sup>5</sup> These programs can look different depending on the size of the institution; the needs, values, and beliefs of the students; and those individuals facilitating the program.<sup>1</sup> Typically, living learning communities are centered on a common theme, require that students reside in a central residential, and are enrolled in related disciplines.

Students who choose to reside in these living learning communities share similar interests and due to their living proximity they are more likely to go through the same educational and campus life experiences. The overall goal of these learning living communities is to stimulate greater educational success through academic and social endeavors. Working together, students and faculty members in living learning communities have the opportunity to form a stronger bonds. Students can share personal feelings allowing faculty members to listen and become aware of how to best assist the student with their personal learning goals.<sup>3,4</sup>

The authors of this study conducted a national pilot study in order to examine how STEM living learning communities are formulated; how well they retain students; to measure how STEM living learning community students are functioning socially and academically; to discover what programs are being offered to students at STEM living learning communities; to learn how involved faculty members are in living communities; and to check the status of STEM freshman programs at different universities. The drivers of this study were to document higher academic success and retention rates.

## Introduction

High school graduates, who choose to continue their post-secondary education have many factors to consider. These new college students struggle with who to live with, what classes to take, what activities to participate in, what major to pursue, and on it goes. Probably the most critical aspect of their consternation is to decide on a specific area of study, i.e., career decision. Arguably, most students want to be surrounded by peers who share the same passions and interests. Many universities and colleges offer programs that provide these kinds of opportunities by hosting STEM living learning communities that offer resources that would not be available in other living environments either on, or off campus.

Living learning communities provide an opportunity for students to build strong relationships inside and outside of the classroom and promotes higher academic performance which results in greater student success.<sup>11</sup> By taking some of the same courses together and being in the same, or similar, academic programs, students achieve academic involvement at a higher rate.<sup>6</sup> Outside of the classroom, students interact with each other in the residence and during any activities hosted by the residential learning community.<sup>8</sup> In addition to providing peer interactions, living learning communities provide students with frequent face-to-face encounters with faculty members, advisors, and mentors who provide support for the students.<sup>6</sup> Living learning communities offer many valuable amenities such as, freshman year programs, welcoming environments, residential assistants with the same major, just to name a few, all of which result in higher student retention, graduation, and overall student success rates.<sup>12</sup>

## Literature Review

Learning communities attract incoming freshman because these communities offer peer and faculty interaction and freshman or first year student programs along with a host of other benefits.<sup>12</sup> Some benefits of learning communities are specialized services for students, which might include, a freshmen program where a major academic advisor, peer advisor, and outside academic professional are designated for the student.<sup>6</sup> Students who live in “themed” living communities are placed in small-enrollment classes with their peers and stay in the same cohort where mentoring is provided.<sup>6</sup> Typically, students who lived in the learning communities had more positive learning experiences as compared to a control group of student who were not part of the learning community.<sup>6</sup> Within the living learning communities students were more likely to express their feelings about issues; experienced a sense of community; felt very positive about their experiences; thought classes were interesting and professors were prepared for class; improved their writing; learned to understand others points of views; worked effectively in group settings; learned to present their own point of view; and learned to make oral presentations.<sup>6</sup> In all cases, the living learning community students felt their experiences in these area were much better than the control group.<sup>6</sup> Students who lived in themed living communities had an improved satisfaction over students who lived in a residential hall or off campus.<sup>3</sup> One of the benefits for students in living learning communities is the connections students build between each other, faculty and staff, the college or university as a whole, and the community.<sup>3</sup> Student networks grow as students feel comfortable making more connections and becoming active participants in their own educational development.<sup>3</sup>

Freshman programs provide first year students with smaller class sizes that allow students to collectively learn and grow.<sup>7</sup> Students who lived in learning communities had better academic support, had more multicultural encounters, and had opportunities to learn leadership skills.<sup>12</sup> Living learning communities are thriving and popular on universities and colleges all over the nation.<sup>5</sup> Compared to traditional residential hall students, living learning students had better grades, better interactions with peers, indicated positive interactions with faculty and peers, positive relations with support staff, and more diversity interactions.<sup>5</sup>

Students who are involved in living learning communities become academic magnets, attracting other students to work with them, which results in higher GPAs.<sup>11</sup> Due to the fact that patterns of student interaction in living communities are quite different than those in random dorms,

institutions can potentially have great influence on the academic relationships student develop.<sup>11</sup> In living learning communities, students are constantly surrounded by peers, either in the classroom or residence halls, and have plenty of opportunities to become involved in social interactions.<sup>8</sup>

STEM learning communities enhance peer academic engagements that often lead to students studying in groups, which provides additional support in these living environments.<sup>10</sup> The formation of study groups, in learning communities, allows students to create support groups and spend more time together outside of the classroom compared to traditional students, thus providing additional assistance.<sup>3</sup> Initially, students will only spend time together during the classes that they share, but eventually they develop strong bonds because students are able to relate to one another based on common interests and studies.<sup>3</sup> Learning communities also offer exciting events that engage students and enhance social interactions.<sup>8</sup>

Forming strong connections with peers are not the only relationships that students develop in learning communities. Learning communities can offer students increased face-to-face interactions with faculty members involved in the program. Assigning a faculty member to each student is recommended practice in a living learning community, in order to provide academic and personal support.<sup>6</sup> Student and faculty relationships are beneficial to both parties.<sup>9</sup> The faculty members' overall goal is to help students grow as learners and community members.<sup>9</sup> By working together, students and faculty members have the opportunity to form a strong bond, allowing faculty members to become aware of how to better assist with the personal learning goals of each student.<sup>3</sup> Strong relationships quickly make students feel more comfortable sharing their personal feelings, and in return, faculty members want to listen.<sup>4</sup> Positive relationships are beneficial for students because they are able to receive academic and personal gains during their time spent in a learning community.

Students are not the only ones benefiting from living learning communities. Research has shown that faculty also benefit from contact with students outside the classroom. However, there are many barriers that prohibit faculty from getting involved in outside activities with students, one of which is the cultural gap.<sup>4</sup> If successful, faculty that form relationships outside the classroom with students and are able to understand students' academic and personal needs, can transfer this to his or her teaching career.<sup>4</sup> Since the relationship between peers and faculty members can become so strong, students that experience this relationship can have a higher success rate compared to non-learning environment students.<sup>8</sup>

Living learning communities have been shown to have a direct positive effect on student's daily lives, college experience, and overall growth as learners, providing students with high satisfaction and better retention rates.<sup>3</sup> These same benefits can be applied to STEM's learning communities. High student satisfaction can be documented in engineering/architecture learning communities with respect to academic experiences, classroom facilities, academic advising, tutoring and academic assistants compared to the other groups studied.<sup>3</sup> The same study also indicated a high satisfaction level with residential life activities.<sup>3</sup> Other research results showed that engineering and computer science living learning communities created an atmosphere where students worked together in groups to study or worked on academic projects resulting in positive peer relationships that are related to higher student satisfaction.<sup>10</sup> The findings higher academic

peer relationships and interaction with faculty and higher satisfaction with living environment for engineering and computer science students.<sup>10</sup> Living learning communities can enhance student satisfaction but lack of faculty involvement and staff planning can significantly reduce the benefits of the learning community.<sup>3</sup> When faculty and staff were intentionally involved with students in the living learning communities, the results indicated a higher level of overall satisfaction within the STEM community.<sup>3</sup> In addition, engineering students that participated in the living learning community were positively impacted by the transition from high school to university by this program, connected positively with the university, had better peer relations, and an overall satisfaction with their experiences.<sup>2</sup>

Satisfaction ignites an urge in students to return to the program where they were able to grow as learners and develop as individuals. Students who return to STEM learning communities for another year show exactly how positive the experience was for the students. However, one study did indeed indicate a higher satisfaction rating of engineering students in the learning community, however there was little to no difference in retention rates, since the retention rates in that school were already high (93.4%).<sup>2</sup>

### **Pilot Study Results**

A nation-wide pilot study questionnaire was sent to a list of engineering universities with STEM programs. Ten universities anonymously answered the survey. A majority of the answers to the survey questions positively correlated with the information found in the literature review. The summary of survey responses is presented in Table 1 on the following page.

Seven (7) respondents indicated that their STEM living learning community program were offered only to first-year students, while three (3) offered the program to first-year and returning students. Seven (7) replied that their STEM program is offered to both males and females, while three (3) indicated their program is offered to only female students. These results are consistent with the literature review.

STEM living learning communities typically offer students many valuable programs throughout the course of the school year. Survey participants were asked what type of programs their STEM learning community offers, asking them to check all applicable programs. One hundred percent (10) of the participants reported that their STEM programs offer faculty interactions and study tables/tutoring. Eight (8) offer career service workshops. Seven (7) offer academic advising and alumni interaction. Five (5) housing or residence specific training. Four (4) offer “other” programs that were not listed in the survey. Other programs included, additional “connect” courses (multidisciplinary), courses based on research, specific courses for the community (service learning), and/or program trips.

Table 1 - Summary of Survey Responses (n=10)

Question 1	STEM Living Community offered to:	
	First-year students only	7
	First-year and returning students	3
	Returning students only	0
Question 2	STEM Living Community offered to:	
	Females only	3
	Males only	7
	Both females and males	0
Question 3	Types of programs are offered:	
	Faculty interaction	10
	Academic advising	7
	Career services workshops	8
	Alumni interaction	7
	Housing specific training	5
	Study tables/tutoring	10
	Other	4
Question 5	Student Ranking compared to all other students:	
	Above average	6
	Average	3
	Below Average	1
Question 6	STEM Living Community retention rates compared to:	
	Higher than students living on campus	8
	Higher than students living off campus	9
	Higher than Greek housing only	6
Question 7	Involvement in other campus activities	
	Yes	9
	No	1
Question 8	STEM Living Community improve student's social life:	
	Yes	7
	No	1
	Don't know	2
Question 9	Number of faculty members involved	
	1-5	5
	6-10	2
	>10	3
Question 10	Number of hours of faculty involvement per week	
	1-5	5
	6-10	5
	>10	0

Participants were asked where the STEM living learning students ranked academically with all other students. Six (6) replied they ranked academically higher than others, three (3) answered the students ranked the same as others, and one (1) indicated that their students ranked below other STEM students.

Participants were asked to compare retention rates between STEM living learning programs with those of students living off campus, students living on campus and Greek housing only (fraternities and sororities). Nine (9) programs had higher retention rates than students living on campus, eight (8) had higher retention rates than students living off campus, and six (6) had higher retention rates than students living in Greek housing.

The survey also asked if their STEM living learning community members were involved in other campus activities. Although we did not specify what types of activities, nine (9) responded that question in the affirmative. The follow up question asked if their STEM Living Community improves the social life of students. Seven (7) replied yes, one (1) replied no, and two (2) didn't know.

As documented in the literature review, faculty members are a crucial element of what makes STEM living learning communities successful. Participants were asked how many faculty members were involved in their STEM living learning programs. Five (5) indicated that one to five (1-5) faculty members were involved, two (2) stated the six to ten (6-10) were involved, and three (3) replied that more than 10 faculty members were involved in their programs.

When asked how many hours faculty spent with involvement in their STEM living learning programs, five (5) responded with one to five (1-5) hours per week, five (5) stated six to ten (6-10) hours per week, and none indicated more than 10 hours of individual faculty involvement per week in their in their STEM living learning community.

## **Conclusions and Future Research**

STEM living learning communities offer students a unique experience. Students are able to share similar interests, reside together, attend classes together, and share their interests academically and socially. Based on the survey results, students involved in STEM living learning communities generally have better grades and higher GPAs than commuter and Greek students. As expected and based on the literature review, the results of the pilot study indicate that students in STEM living learning communities academically rank higher and have better retention rates as compared to other students.

The survey results indicate that students in living learning communities have a higher level of social interaction and are provided more opportunities for student involvement. In addition, these students are more actively involved in activities that are university sponsored. On an individual level, each student involved in a living learning community that was assigned a faculty mentor to assist them academically and personally, the resulting benefits were even more pronounced. Students were able to interact with the faculty members while also creating strong relationships with them. These relationships are a major component of the overall student satisfaction with the STEM living learning community. Living learning communities that provide the resources (residence arrangements, course collaboration, faculty mentors, social opportunities, etc.) produce significantly higher satisfaction rates and increased retention. Living learning communities are resource intensive, however based on the results of this study the benefits outweigh the costs (i.e., cost in time and effort).

It is anticipated that future research efforts will include an expanded study to collect additional assessment data from a more robust sampling. Statistical analysis of the data will determine the critical indicators of the success of living learning communities. Evaluation of the critical indicators will lead to the development of “best practices” for creating and sustaining living learning communities.

## References

1. Bechtel, J. (2012). Building an Entrepreneurial Living-Learning Community. Innovation Living-Learning Community, University of Illinois Urbana-Champaign.
2. Flynn, M.A., Everett, J. W., & Wittinghill, D. (2016). The impact of a living learning community on first year engineering students. *European Journal of Engineering Education*. Vol. 41, No. 3, 331-341.
3. Frazier, W. & Eighmy, M. (2012). *Themed Residential Learning Communities: The Importance of Purposeful Faculty and Staff Involvement and Student Engagement*. Tufts University, Medford, Massachusetts.
4. Golde, C., & Pribbenow, D. (2000). *Understanding Faculty Involvement in Residential Learning Communities*. *Journal of College Student Development*.
5. Inkelas, K. (2007). The National Study of Living-Learning Programs: 2007 Report of Findings. University of Maryland-Universities Libraries DRUM. Retrieve from <http://drum.lib.umd.edu/handle/1903/8392>
6. Johnson, J., & Romanoff, S. (1999). *Higher Education Residential Learning Communities: What are the implications for student success?* *College Student Journal* (Vol. 33) p. 385.
7. Koerner, J. (2008). *Outcomes of Student Participation in College Freshman Learning Communities*. Florida Atlantic University.
8. Pike, G. (1997). *The Effects of Residential Learning Communities on Students' Educational Experiences and Learning Outcomes During the First Year of College*. University of Missouri- Columbia.
9. Schein, H. (2005). *The Zen of Unity One: Residential Learning Communities Can Foster Liberal Learning at Large Universities*. *New Directions For Teaching and Learning* (no. 103).
10. Shushok, F., & Sriram, R. (2010). *Exploring the Effect of a Residential Academic Affairs-Student Affairs Partnership: The First Year of an Engineering and Computer Science Living-Learning Center*. Baylor University, Texas.



11. Smith, R. (2015). *Magnets and Seekers: A Network Perspective on Academic Integration inside Two Residential Communities*. *Journal of Higher Education* (Nov/Dec 2015). Vol 86, 8. p.893-922
12. Spanierman, L., Soble, J., Mayfield, J., Neville, H., Aber, M., Khuri, L., & De La Rosa, B. (2013). *Living Learning Communities and Students' Sense of Community and Belonging*. *Journal of Student Affairs Research and Practice*, 50(3), 308-325).
13. Tito, V. (1998). Learning Communities: Building Gateways to student success. *The National Teaching and Learning Forum*. 7(4). Retrieved from <https://vtinto.expressions.syr.edu/wp-content/uploads/2013/01/ACPA-1999-Keynote.pdf>