STEM as "Minority": A Phenomenological Case Study of How Students of Color Perceive Their Experience in a STEM Living-Learning Program

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The future of the U.S. scientific workforce depends on graduating college students in science, technology, engineering, and math (STEM) fields. The completion rate of STEM students is a national concern, especially among students of color. This qualitative study examines the experiences of students of color in a living-learning program for STEM students. Five themes were discovered from students' meaning-making. Four of the themes integrate well with existing literature. The fifth theme, *STEM as Minority*, was not found in the literature and is a new contribution to the field of knowledge on how environments can be purposed to support STEM students.

As scholars and practitioners of higher education work to promote student success, there is increasing concern for students in science, technology, engineering, and mathematics (STEM) fields. Findings from a six-year longitudinal study indicated that only 37% of students majoring in a STEM field completed their degree (Chen, 2009). Students who entered computer science or engineering had a lower rate of undergraduate degree completion than other STEM majors, and success and completion issues are only intensified when considering students of color in STEM fields (Horwedel, 2006; Le & Gardner, 2010; Palmer, Davis, & Thompson, 2010). Despite these alarming trends, there remains a societal need for more graduates in these fields. The future of the U.S. scientific workforce and advancement in science depend on talented STEM college graduates (Griffith, 2010).

Several scholars have examined issues pertaining to student success in STEM fields. Veenstra, Dey, and Herrin (2009) developed a model for first-year engineering retention that emphasized pre-college characteristics such as prior academic achievement and entrance test scores. Rask (2010), in his study based on nine years of data from a northeastern liberal arts college, also found that prior academic achievement significantly correlated with participation in STEM fields. Moreover, he did not find significant influences on student success from role model or peer influences. These findings emphasize that interventions are necessary before students arrive at college, but offer little

insight into what colleges can do to make a significant impact on student success.

Other research, however, indicates that college environments do impact success for STEM students. Ost (2010), in his study at a large research university, found that positive peer influences can increase the probability of persistence. Although Ost found a large persistence gap between European American students and students of color, he also discovered that students most unlikely to persist show the greatest gains from exposure to high-quality peers. Griffith (2010) found similar results in her research on STEM students of color utilizing national, large-scale datasets. Therefore, colleges interested in helping STEM students of color succeed should place emphasis on the institutional environment (Museus, Palmer, Davis, & Maramba, 2011). One way in which institutions achieve this goal is by creating living-learning programs.

Living-Learning Programs: Environments for Success

Living-learning programs (LLPs) continue to gain recognition as effective institutional environments for promoting college student success. Although LLPs differ in their structure and implementation across institutions, they generally represent programmatic attempts to intentionally connect the living environment of students with what students learn in their academic pursuits. Recent research on LLPs demonstrates the overall positive effects of these efforts on the student experience (Brower & Inkelas, 2010; Inkelas, Daver, Vogt, & Leonard, 2007; Inkelas, Vogt, Longerbeam, Owen, & Johnson, 2006; Pike, Kuh, & McCormick, 2008; Rowan-Kenyon, Soldner, & Inkelas, 2007; Wawrzynski & Jessup-Anger, 2010). As Pike and his colleagues (2008) noted, "The reason for the growing

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popularity of learning communities is simple: they work" (p. 30). Therefore, LLP research is entering into a new phase that examines the conditional effects of how and for whom these programs work.

As research on LLPs grows, scholars differentiate among different types of programs and their subsequent outcomes. For instance, some studies indicate that characteristics of individual LLPs help to determine the impact on students (Inkelas, Soldner, Longerbeam, & Leonard, 2008; Soldner & Szelenyi, 2008). In this regard, there is a paucity of research regarding the effects of living-learning programs on students of color. Research also demonstrates that students of color need more assistance from colleges than is currently offered. Building on the work of Hurtado and Carter (1997), Johnson and colleagues (2007) found that African American, Hispanic/Latino, and Asian Pacific American students reported a weaker sense of belonging than European American students. However, they found that the perception of on-campus residential environments as socially supportive was related to the sense of belonging of students of color. Therefore, they suggested that researchers and practitioners focus their attention on residential environments as a way of improving conditions for minority college students. Inkelas et al. (2006) examined LLPs in their study with students of color, but their findings did not differ from prior general literature: Students of color were less likely to dialogue with peers and had a negative perception of the campus racial climate.

In conjunction with the limited research on LLPs and students of color, only a few studies have examined the influence of LLPs on students with STEM majors. Pace, Witucki, and Blumreich (2008) described the development and benefits of an LLP specifically for females in STEM fields, but their work is not an empirical study, and the benefits described are anecdotal in nature. Although Inkelas and colleagues' (2006) research on LLPs and intellectual growth at three large universities included STEM students, they admitted that a limitation of their work was their need to aggregate all participants together, thus making it unclear what the isolated effects were for STEM students. Follow-up research on female students demonstrated that participation in women-only STEM LLPs positively relates to aspirations to attend graduate school (Szelenyi & Inkelas, 2011). Shushok & Sriram (2010) found that STEM students in an LLP at one institution had more informal contact with faculty, academic contact with faculty, academic contact with peers, and higher overall satisfaction compared to a self-selected control group of STEM students who were not in the LLP. While these findings help to reveal how LLPs can specifically benefit students in STEM majors, none of these scholars attempted to isolate the conditional effects of students of color.

Conceptual Framework

LLPs draw from Astin's (1993) inputs-environment-outcomes (I-E-O) model, positing that student inputs combine with the institutional environment to produce student outcomes. Tinto (1975) promoted the terms *academic integration* and *social integration* in his work on college student retention. These two constructs are foundational for research, practice, and dialogue concerning the college student experience and attrition. They also serve as primary objectives for the initiation and implementation of LLPs in higher education (Smith, MacGregor, Matthews, & Gabelnick, 2004). Museus and Quaye (2009) also add to the conceptual framework with their development of an intercultural theoretical framework of minority student persistence that includes the importance of both collective agents (subcultures such as STEM majors and programs such as LLPs) and individual agents (peers and faculty) fostering connections with students of color for their success (Museus et al., 2011).

Purpose

As literature on LLPs becomes more extensive, three particular gaps are evident. First, the growing amount of research on LLPs is almost exclusively quantitative in nature, a limitation acknowledged by scholars (Commander & Ward, 2009). Qualitative studies can contribute to the understanding of not just if, but how and who living-learning programs benefit (Blackhurst, Akey, & Bobilya, 2003; Wawrzynski, Jessup-Anger, Stolz, Helman, & Beaulieu, 2009). Second, there is a deficit of research on the experiences of students of color in LLPs, presumably connected to the difficulty of acquiring a large enough subset of students of color in LLPs for quantitative analysis. Finally, there is a lack of research that demonstrates if and how LLPs can help promote success with STEM postsecondary students. In order to address these gaps, this study utilized a phenomenological case study methodology to gain understanding of the experiences of students of color in a STEM living-learning program. This study was funded by a grant from the NASPA Foundation.

Methodology

Our study site is a large private research university in the Southwest. We chose this institution for several reasons. The institution is predominantly European American, comprising more than 70% of the student body. Also, the STEM LLP examined in this study was well established because it was the first LLP on this campus. One of the expressed goals in the development of this LLP was to improve the success rate of students of color and females in

STEM majors. Utilizing Inkelas et al.'s (2008) typology of living-learning programs, this LLP is categorized as a *large, comprehensively resourced, student affairs/academic affairs collaboration program*. Researchers have found that this type of LLP leads to stronger student outcomes (Inkelas et al., 2008; Wawzynski & Jessup-Anger, 2010). These factors led us to believe that this particular LLP served as a model site for the purposes of this study.

In terms of sampling, Creswell (2007) suggested three to ten participants for a phenomenological study. Our population included 13 students of color in the STEM LLP who were at least in their sophomore year at the institution. We chose not to include first-year students as we felt they did not have enough time to experience and develop opinions about the environment. Of the 13 students who met our criteria, nine chose to participate in the study (see Table 1). Students' race/ethnicity consisted of African American (1), East Asian (2), Hispanic (5), and South Asian (1). While scholars differ on their definitions of students of color, Museus et al. (2011) include Asian students in the minority category for STEM fields. All students were classified as either sophomores (3) or seniors (6). Additionally, all participants were domestic students born in the United States.

As students in previous research have described LLPs as "cultural phenomena" (Wawrzynski et al., 2009, p. 156), we utilized phenomenological case study methods stemming from a social-constructivist epistemology to address our research questions. Students of color in a STEM LLP served as the phenomenon and the specific LLP served as a case study. Due to the nature of phenomenological case study research design, we conducted this study at a single institution in order to understand the experiences of students in that particular case. Two initial, broadly structured questions guided this study in order to draw out the meaning-making of participants: 1) What have you experienced in your years in this LLP, and 2) What situations or examples contributed to those experiences? We collected the data through in-person semi-structured individual interviews lasting approximately one hour, and we conducted follow-up interviews as necessary. The semi-structured interviews acquired data from predetermined questions, but also allowed room for unplanned questions and exploration of experiences of the participants (Merriam, 2009). We analyzed the qualitative data utilizing phenomenological and case study data analysis procedures (Moustakas, 1994; Yin, 1989), a methodology used by other scholars to understand the college experience of students of color (Museus & Quaye, 2009). As Flyvbjerg (2006) notes, case study research demonstrates the value of practical knowledge and contributes to scientific development through both hypothesis testing and theory building. After each interview, we discussed and recorded our immediate, specific, and overarching impressions. We then analyzed the

Participants of the Study*

Pseudonym	Gender	Race / Ethnicity	Classification	Major
Ann	Female	Hispanic, European American	Sophomore	Engineering
Connor	Male	African American	Senior	Computer Science
Daniel	Male	East Asian	Senior	Computer Science
Deborah	Female	East Asian	Sophomore	Computer Science
Marcus	Male	Hispanic	Sophomore	Bioinformatics
Stephen	Male	Hispanic	Senior	Mechanical Engineering
Suzie	Female	South Asian	Senior	Bioinformatics
Tim	Male	Hispanic	Senior	Mechanical Engineering
Tara	Female	Hispanic	Senior	Mechanical Engineering

*Total number of students in the STEM LLP is 230

Table 1. Participants of the study

data in four phases: independent open coding by the two researchers, independent development of themes by the two researchers, comparison and integration of codes and themes, and cross-checking each transcript with the newly developed themes (Patton, 1990). To help strengthen the trustworthiness of data collection, we conducted member checks with participants and searched for discrepant data in analysis. If discrepancies were found, themes were reevaluated against data and necessary changes were made.

Limitations

Findings should be considered in the context of certain limitations. We are not attempting to generalize our findings, but instead to offer insight into the experiences of students of color in this particular STEM LLP. The single site of this study requires caution when applying findings to other campuses. Furthermore, this study attempts to capture the experience of students who are not part of the majority population; however, grouping all students of color together has limitations. The common perceptions and attitudes among these students of color highlighted below do not preclude differences among them by race/ethnicity. Such differences were outside of the scope of this study and were not explored, but nonetheless represent important avenues for future research.

Findings

We present the findings as five overarching themes to describe the essence of the experience and meaning-making of these students of color in the LLP (see Table 2). Four of the themes – *Selection, Academic Integration, Social Integration,* and *Convenience* – integrate well with existing literature on LLPs. We did not find our fifth theme, *STEM as Minority*, in the relevant literature and believe it is a new contribution to the field of knowledge. In this section, we will present these emerging themes, discuss the essence of the students' experience, and provide implications for future research and current practice.

Theme 1: Selection

Students wishing to reside and participate in this LLP must self-select and apply. Students in this study had a clear impression that the LLP was a predominantly academic space that could help them succeed. Most students mentioned that living in another residential space would have hindered their academic success. Ann, a sophomore engineering major who identified herself as half Hispanic and half European American, noted, "There's no doubt that, had I been living in a different dorm, that I wouldn't have done as well in my classes." Marcus, a Hispanic sophomore

majoring in bioinformatics, agreed, describing the "company standard of maturity and intelligence" as higher in the LLP than other residence halls. Three of the students we interviewed lived in a traditional residence hall prior to the LLP and confirmed the perceptions of the other students. Tim, a senior mechanical engineering student who identified himself as Hispanic, said about his previous traditional first-year residence hall, "They didn't have the same focus and the same determination and the things that I needed in order to succeed as an engineering major." Connor, an African American senior computer science major, described his previous traditional first-year residence hall as having "no one that you know there that can help you out of the classroom unless you just get, like, absolutely lucky." Selection to reside in this LLP represented an expectation of academic success for these STEM students of color.

Theme 2: Academic Integration

When discussing the LLP, students described a positively competitive environment that pushes them to be their best; an environment in which everyone is striving for the same goals. Tim described his experience: "I know while I was here, I went from not caring to 'I want an A' on every assignment. I want perfection . . . seeing everyone striving to succeed, you know, it was just uplifting." Connor said, "I would say I put a lot more effort into it when I came to the [LLP] than when I was in [my previous residence hall] . . . the general attitude here is usually if it's not an A, keep working . . . you definitely want to strive to be up there at the top." Tara, a Hispanic mechanical engineering major in her senior year, described the people of the community as "a lot of mature and driven students that are all together and it's very motivating, and you just want to be a part of that." Deborah, a sophomore computer science major with Chinese heritage, did not believe she would study as much living outside the LLP. Ann remarked, "Knowing people that have lived in other dorms, it's just that the atmosphere that they have, they didn't like to spend time in there studying." Generally, the students believed that living in the LLP had a direct impact on their motivation.

Peer academic support was a strong and consistent subtheme of academic integration found throughout the interviews. Stephen, a mechanical engineering major in his senior year, said, "My freshman year we would get together in the middle of the lobby and work on our homework together, and it's just as easy to go down the stairs to the main lobby." Daniel, a senior computer science student with East Asian heritage, echoed similar experiences in his interview: "If I ever need anything on the last minute or have questions like, I can just go to a roommate and ask him because they probably either have the same question or know the answer." Overall, these STEM students seemed to

never feel alone in their academic journeys. The students also described a culture of mentoring that fostered feelings of academic encouragement and support from their peers. Younger students relied on upperclassmen after they moved into the LLP. Tim said, "That's another thing about the [LLP]. There are definitely upperclassmen that can help you out along the way." These students then discussed their transition from needing the help to helping the younger students as upperclassmen themselves. Connor remarked, "I've seen lots of people get help around the [LLP]. I've given help to a lot of people . . . as well as taken it, so it's definitely not a one-way, it's more back and forth." Stephen said, "I have friends that are my age, friends that are older, friends that are much younger . . . there shouldn't be any divisions there." All participants mentioned a direct impact from the LLP on their academic performance and integration, specifically through peer support, increased motivation, and a culture conducive to success.

Theme 3: Social Integration

Every student we interviewed had an overwhelming theme of "community" in their language describing the LLP. They expressed a sense of belonging when talking about what it means to live with students in the same major. Deborah described the LLP as "a group that you actually belong to." Several students also described it as "home." Tara mentioned that since her family moved to London while she was in college, she considers the LLP home. Tim said, "You can be real with these people. These people care. These people are a second family." Connor described "a change of inner feeling" when he moved into the LLP: "I found myself more at home."

A sense of friendship led to a stronger willingness to work out conflicts with roommates. Both Suzie, a senior bioinformatics major with South Asian heritage, and Deborah described situations in which they had to work out disagreements. For Suzie, the disagreements were at least partially due to her minority culture, but having a common STEM bond with other students made it easier for her to resolve the cultural conflict with direct conversation:

> Living with 5 other non-colored people, sometimes I just kind of felt left out, cause of the way I do things and stuff. We just talked about it: this is the way I do things and they got used to the fact . . . then they're like, "Oh, OK," so they got it.

Social integration appeared to build upon the foundation of academic integration for these students of color in the LLP. Students felt part of a community and felt more at ease to work through conflicts directly.

Theme 4: Convenience

Although the LLP contributed to their academic and social integration, all of the students also mentioned convenience of space when discussing their experiences. Many of them mentioned that the LLP is located next to a STEM academic building on campus, making it easier for them to connect with their faculty. Tim described how "being right next to the [Engineering] building that close is definitely conducive to you going over there and asking questions any time of the day . . . it's a short walk away." This convenience added to the probability of some students asking for help, as Tara indicated: "And if I need to go to the engineering building, which is quite frequent with professors' questions and such, it's a two minute walk and I really don't feel a burden in doing so." Suzie noted that her friends who do not live in the LLP interact less frequently with professors: "You won't come as much, cause professors have their own schedule in the engineering department, so you really can't figure out what their time schedule is, so you can just, like, check to see if they're there."

Theme 5: STEM as "Minority"

A theme that rapidly emerged from our interviews and was reaffirmed during member checks was the idea that being a student in a STEM major meant being, in essence, a minority when compared to other students on campus. The language from all participants indicated that they felt part of a special community and shared a similar mindset with fellow STEM majors. The findings suggest that living in the LLP helped students to cope with their perception of having "minority" status as a STEM major on campus. Suzie described that "being a minority on campus, we're still a group and that's what I like about [the LLP], we're still a group . . . it's just kind of that cohesive kind of feeling." There was a rite of passage that was described when students talked about choosing to be a STEM major.

Although the term *minority* is typically used to describe race or ethnicity in comparison with the majority (Museus et al., 2011), Suzie used the term to describe STEM majors instead. Unexpectedly, participants also commented that their race/ethnicity was not a major contributing factor in perceiving how the LLP affected them. As Deborah described, "I haven't felt like I've been treated differently I guess, it just, it just feels like I'm another person that's part of everyone else." Deborah goes on to articulate a theme we heard consistently from students:

> Ultimately my culture has nothing to do with what I am interested in, well except for some things, but like the computer science part I don't think it's that odd. At the same time, there's plenty of, I know there's plenty of Asian people that have interest in it but America's population is mostly white. We're obviously still going to be a minority

despite having such interest in it, so I don't really think about it in that aspect at all, I think I would probably be more of a minority as a computer science student than Asian.

Tara, when asked to describe how the LLP affected her as a minority, said, "I didn't see myself as, you know, she's the Hispanic girl. I see myself as a student." Ann even suggested self-identifying with her major before her race: "I wouldn't think of myself as Ann, college student, Hispanic . . . I'd be like, engineering major. If I wasn't living on a solely engineering floor, I would definitely feel like a minority." During member checking, all participants agreed that they felt more of a minority as a STEM major on campus as a whole than they did as a student of color. These findings were surprising, given that the LLP was predominantly European American, even more so than the institution. Tim discussed that he never felt discrimination growing up because he lived in a predominantly Hispanic community, but "I definitely got it from other majors. I mean when everyone else is out having fun you want to have fun too . . . We have fun in [STEM] but you have to do it strategically in a very smart way." This theme of feeling more of a minority as a STEM major is articulated by Stephen in his closing remarks, "I guess as an engineer you are a minority in that

you have a very intense curriculum that you're battling, that you've chosen to follow."

Discussion & Implications

In this study, we sought to address three gaps in the current literature concerning living-learning programs and student success: (a) few qualitative investigations have been conducted on living-learning programs, (b) few empirical studies investigate living-learning programs and students of color, and (c) more research is needed to understand how to best promote academic success for students in STEM fields. The findings of this study confirm what is found in the current LLP literature, validate what has been known about LLPs but not empirically studied, and add new insight on LLPs and STEM students.

Confirming What We Know in the Literature

Two themes – Academic Integration and Social Integration – confirm what is found in the current literature on LLPs (Inkelas et al., 2007). In a rare qualitative investigation of LLPs, Wawrzynski et al. (2009) found themes such as "promoting seamless learning" (p. 144), "perceptions of the environment as scholarly" (p. 147), and "promoting an ethos of relatedness among faculty, staff, and

Sample Codes Translated into Themes

Sample Quote	Source	Sample Code	Theme
"I'd heard about the [STEM LLP] my freshman year, or before my freshman year coming into Baylor. And I was like, no, I want to feel the real college experience—see what it's actually like and all that stuff, and so I didn't enroll into it. And that was definitely a mistake."	Tim	Regrets not initially enrolling in LLP	Selection
"And so, it's like my roommates we all have the same homework and just like they said it would be. Everybody studies a little more than you would if you were living in a regular dorm."	Ann	Increased studying	Academic Integration
"Like, video games and just, TV, or we watch the same kind of shows and just like . . . news too, as well, like, he'll come in and like, "Did you hear about this" and like, "No" and I go look up or something like that."	Daniel	Hanging out together	Social Integration
"It's right next to the engineering building, it's extremely convenient, there's a parking garage about, you know, two minutes away. It's just the ideal place if you're wanting to succeed and just be an overall good student."	Tara	Proximity to engineering building	Convenience
"Being an engineering student itself, does put yourself, you put yourself in a minority category."	Suzie	Minority as engineering	STEM as Minority

Table 2. Sample codes translated into themes

peers" (p. 150) that connect with academic integration. Similarly to Johnson et al. (2007), Wawrzynski and colleagues also found that residential environments can increase sense of belonging and social integration in college students. Although academic integration and social integration have been known advantages of LLPs, it was unknown if and to what extent these benefits applied to students of color or STEM students. Findings from this phenomenological study demonstrate that LLPs are helpful in fostering these two constructs with this subpopulation.

Current literature on college students tends to examine academic integration on an individual level and social integration on a communal level, but little is said about academic integration on a communal level. Scholars contend that the way researchers define academic integration can be problematic (Braxton, Hirschy, & McClendon, 2004). For instance, should researchers categorize students studying in community as academic or social integration? LLPs purposefully blur these lines for student learning and development, and traditional terminology may not quite capture what LLPs do for students.

Empirically Validating What We Know Intuitively

Two other themes – Selection and Convenience – fit well with the LLP literature but are not explicitly found in other research findings. Inkelas (2008) advocated for the next generation of LLP scholarship to address unresolved issues in the research, such as studying outcomes of LLPs that are known intuitively but not empirically tested. There is little research on the mindsets and expectations of students entering into an LLP, although it is understood that self-selection and the motivation to participate could influence the outcomes of participation (Jones, Laufgraben, & Morris, 2005; Pike, Hansen, & Lin, 2011). Wawrzynski and colleagues (2009) discussed how the "community norms and expectations" (p. 149) of students in three LLPs helped to promote the scholarly environment. Indeed, the expectations of the students in this study appeared to powerfully influence their experience, a finding that is further emphasized by the fact that these students were able to recall years later their past mindsets upon entering into the LLP. Wawrzynski et al. also found the physical structures of LLPs to impact the student experience. In our study, students benefited from the convenience that stemmed from the design and layout of physical structures. This convenience functioned as a catalyst for other experiences related to academic and social integration.

New Insight into LLP Research

The final theme, STEM as Minority, is the surprise of our findings. Students felt like they were minorities as STEM students on a campus comprised of mostly non-STEM students. In fact, the feelings of being a STEM minority were stronger in these students than those of being a racial minority on a predominantly European American campus. We did not discover this theme in any previous research on students of color, LLPs, or STEM students, but the overwhelming agreement of this theme by our participants urged its inclusion in this study. It is important to note that some of these students may be struggling with their identity as a student of color, navigating the extent to which they desire to accept or reject their identity based upon race (Vandiver, Fhagen-Smith, Cokley, Cross, & Worrell, 2001).

Scholars suggest the assessment of complex responses in order to address issues of inclusion at a particular college (Torres, Howard-Hamilton, & Cooper, 2003). The students in this study were high-achieving racial and academic minorities who were given the opportunity to live with students who shared their status as academic minorities (STEM students in a living-learning program) but who did not share their status as racial minorities (the LLP was predominantly European American). Even though the students in this study represented a racial minority, none of them indicated that their participation in the LLP was affected by that status. Therefore, it seems that the commonality in one minority status (STEM) compensated for the other minority status (ethnic/racial minority), at least in part. Students struggled, or perceived that they would struggle, outside of a community that academically and socially supported their status as a STEM minority.

Implications for Future Research

This study has many implications for future research. The research methodology for this study allowed for a level of analysis that is not captured in previous quantitative investigations. More qualitative research is needed in order to further discover why and how LLPs work as learning spaces for students. In addition, as research on LLPs continues to grow, it will become increasingly important for research to examine the conditional effects of LLPs.

The most important finding from this study is that majoring in a STEM field was viewed as a minority status, which also helped students cope with racial and ethnic minority marginalization. Future research can help explain whether this finding is a shared theme among students of color in STEM living-learning programs.

When the findings of this study are examined within the context of other scholarly work of this nature (Inkelas et al., 2008; Wawrzynski et al., 2009), two questions arise. First, among the different types of LLPs, are academically-based LLPs especially helpful for students? In their typology of LLPs, Inkelas and colleagues (2008) found that students in large, comprehensively resourced, student affairs/academic

affairs collaboration programs exhibited particularly strong learning outcomes. The LLP in this study fits into that category and further confirms their findings. If the answer to this first question is in the affirmative, it leads to another question—among academically based LLPs, are those designed to attract high-achieving students in a rigorous program even more beneficial? More research is needed to determine ways in which to challenge, support, and engage high-achieving students on college campuses.

Implications for Practice

In their monograph, *Enacting Diverse Learning Environments*, Hurtado, Milem, Clayton-Pederson, and Allen (1999) list 12 principles for improving the climate for diversity on college campuses. LLPs directly enact two of these principles: (a) *create collaborative and cooperative learning environments where students' learning and interaction among diverse groups can be enhanced* (p. 74) and (b) *initiate curricular and cocurricular activities that increase dialogue and build bridges across communities of difference* (p. 75). Building on the work of Hurtado and her colleagues, this study highlights the need for college leaders to find common bonds between students of diverse racial backgrounds so that racial differences can be addressed in the context of commonality. For students entering into STEM fields, such a bond can effectively come from their common academic pursuits.

In order to improve the learning and development of students of color in STEM fields, higher education administrators need to understand these students' experiences. Such findings can be utilized to create, implement, and evaluate programs that specifically meet the needs of students of color, a practice highly encouraged but not widely implemented. Our findings not only indicate that LLPs are helpful for STEM students of color, but also help uncover why they are helpful. Students enroll into these programs with expectations for success beyond those provided through traditional residential environments. Students' relationships with one another serve as a vital part of their learning and development, both socially and academically. STEM living-learning programs can help facilitate and develop these relationships through programming, room assignments, and formal mentorship opportunities. All of the students in this study mentioned that they benefited from and contributed to the development of students in other classifications (i.e., first-year, sophomore, junior, and senior). However, many residence halls are segregated by classification, hindering the mentorship that can occur between students in various stages of their academic journeys. Informal mentorship can be promoted by creating environments in which students across classifications have meaningful ways to interact with one another.

Our findings also revealed that convenience played an important role in the students' increased interaction with professors. Institutions hoping to foster student-faculty relationships should make such interactions as easy as possible for the students. Students also mentioned that the close proximity between the LLP and their primary academic building allowed for them to interact with one another and form study groups outside the classroom. In order to help students participate in desired activities, those activities should be as convenient as possible.

The STEM as Minority theme has important considerations for scholar-practitioners. Students described how this camaraderie helped enhance their college experience, both socially and academically. There is no doubt that students identified strongly with this community, possibly resulting in fewer racial tensions than would normally develop on a predominantly European American campus. Practitioners can help advance and develop this camaraderie by continuing to create STEM living-learning programs and other environments in which diverse students are able to bond academically with one another both inside and outside the classroom.

Our finding that status as a student of color did not impact students as much as being a STEM major could be a double-edged sword, however. The data shows that these students benefited from living and learning with other STEM students to such an extent that this common bond compensated for tensions that might arise from racial and ethnic differences. On the other hand, the commonality found in the STEM community may unintentionally encourage ignorance to racial identity development (Museus et al., 2011). The question must be raised whether students are overcoming racial tensions through the STEM community or if they are using the community to avoid critical steps of racial identity development. This is an important question that can guide further research and practice on how to help STEM students of color succeed in college.

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